United States Department of Agriculture

Natural Resources Conservation Service

In cooperation with Kentucky Natural Resources and Environmental Protection Cabinet and Kentucky Agricultural Experiment Station

Soil Survey of Carlisle and Hickman Counties, Kentucky

How To Use This Soil Survey

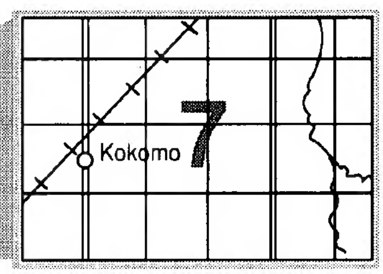
General Soil Map

The general soil map, which is the color map preceding the detailed soil maps, shows the survey area divided into groups of associated soils called general soil map units. This map is useful in planning the use and management of large areas.

To find information about your area of interest, locate that area on the map, identify the name of the map unit in the area on the color-coded map legend, then refer to the section **General Soil Map Units** for a general description of the soils in your area.

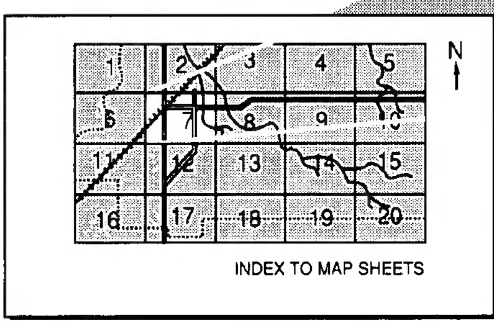
Detailed Soil Maps

The detailed soil maps follow the general soil map. These maps can be useful in planning the use and management of small areas.

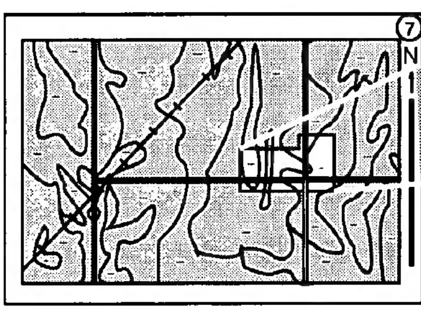


MAP SHEET

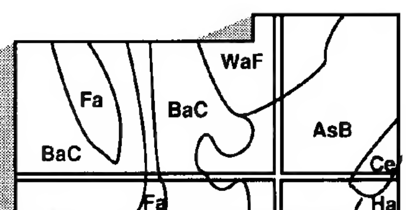
To find information about your area of interest, locate that area on the **Index to Map Sheets**, which precedes the soil maps. Note the number of the map sheet, and turn to that sheet.



Locate your area of interest on the map sheet. Note the map unit symbols that are in that area. Turn to the **Index to Map Units** (see Contents), which lists the map units by symbol and name and shows the page where each map unit is described.



MAP SHEET



AREA OF INTEREST

NOTE: Map unit symbols in a soil survey may consist only of numbers or letters, or they may be a combination of numbers and letters.

The **Summary of Tables** shows which table has data on a specific land use for each detailed soil map unit. See **Contents** for sections of this publication that may address your specific needs.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (formerly the Soil Conservation Service) has leadership for the Federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in 1989. Soil names and descriptions were approved in 1990. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1990. This survey was made cooperatively by the Natural Resources Conservation Service, the Kentucky Natural Resources and Environmental Protection Cabinet, and the Kentucky Agricultural Experiment Station. It is part of the technical assistance furnished to the Carlisle County Conservation District and the Hickman County Conservation District.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

All programs and services of the Natural Resources Conservation Service are offered on a nondiscriminatory basis, without regard to race, color, national origin, religion, sex, age, marital status, or handicap.

Cover: A farm pond, soybeans, and pasture in an area of the Loring-Adler general soil map unit in Carlisle County.

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Issued July 1997

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Summary of Tables

Foreword

This soil survey contains information that can be used in land-planning programs in Carlisle and Hickman Counties. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to ensure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil maps. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Natural Resources Conservation Service or the Kentucky Cooperative Extension Service.

Billy W. Milliken
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Soil Survey of Carlisle and Hickman Counties, Kentucky

By Rudy Forsythe, Natural Resources Conservation Service

Soils surveyed by Ronnie B. Froedge, Rudy Forsythe, Johnson C. Jenkins, Debra K. Brasfield, and Charles L. Moore, Natural Resources Conservation Service, and by Kenneth E. Scott, Division of Conservation, Kentucky Natural Resources and Environmental Protection Cabinet

United States Department of Agriculture, Natural Resources Conservation Service, in cooperation with
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Carlisle and Hickman Counties are in the extreme western part of Kentucky, bordering the Mississippi River (fig. 1). Bardwell is the county seat of Carlisle County, and Clinton is the county seat of Hickman County. In 1986, Bardwell had an estimated population of 930 and Clinton had an estimated population of 1,560 *(16)*. Carlisle County has a total land area of 122,112 acres, or 190.8 square miles. Hickman County has a total land area of 156,871 acres, or 245.1 square miles. Areas of water, mainly the Mississippi River, make up 5,242 acres in Carlisle County and 5,055 acres in Hickman County *(28)*.

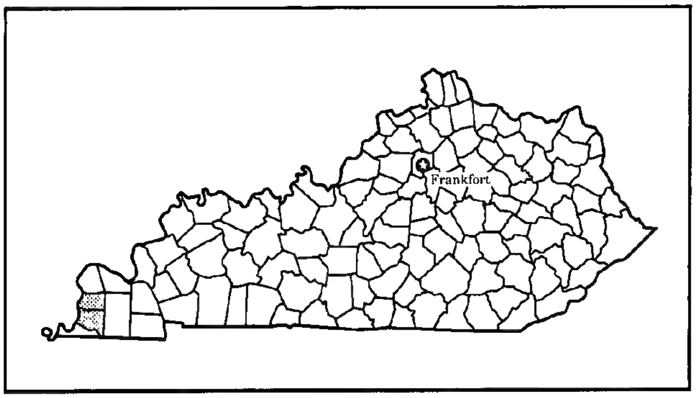

Figure 1.—Location of Carlisle and Hickman Counties in Kentucky.

General Nature of the Survey Area

This section gives general information about Carlisle and Hickman Counties. It describes climate; early history; geology, physiography, drainage, and relief; farming; and natural resources.

Climate

Carlisle and Hickman Counties have long hot summers and rather cool winters. An occasional cold wave brings near-freezing or subfreezing temperatures but seldom brings much snow. Precipitation is fairly heavy throughout the year, and prolonged droughts are rare. Summer precipitation falls mainly as afternoon thunderstorms and is adequate for all of the crops commonly grown in the survey area.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Bardwell, Kentucky, in the period 1964 to 1987. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter, the average temperature is 36 degrees F and the average daily minimum temperature is 27 degrees. The lowest temperature on record, which

occurred at Bardwell on January 17, 1982, is -21 degrees. In summer, the average temperature is 77 degrees and the average daily maximum temperature is 88 degrees. The highest recorded temperature, which occurred at Bardwell on July 15, 1980, is 104 degrees.

Growing degree days are shown in table 1. They are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (50 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The total annual precipitation is about 52 inches. Of this, nearly 28 inches, or more than 50 percent, usually falls in April through September. The growing season for most crops falls within this period. In 2 years out of 10, the rainfall in April through September is less than 23 inches. The heaviest 1-day rainfall during the period of record was 4.55 inches at Bardwell on December 3, 1978. Thunderstorms occur on about 45 days each year. Severe local storms, including tornadoes, occasionally strike in or near the survey area. They are of short duration and cause damage in scattered small areas.

The average seasonal snowfall is about 15 inches. The greatest snow depth at any one time during the period of record was 19 inches. On the average, 15 days of the year have at least 1 inch of snow on the ground. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 80 percent. The sun shines 65 percent of the time possible in summer and 45 percent in winter. The prevailing wind is from the south-southwest. Average windspeed is highest, 11 miles per hour, in spring.

Early History

Carlisle and Hickman Counties are two of the eight counties making up the Jackson Purchase. This territory was formerly tribal land of the Chickasaw Indians. The United States purchased the land from the Indians for $300,000 in 1818, after successful negotiations by General Andrew Jackson and Governor Isaac Shelby *(14)*.

Carlisle County was established on May 3, 1886, as the 119th county in Kentucky. The county was named after John Griffin Carlisle, a prominent statesman *(14)*. Bardwell, the county seat, was a small village with a population of about 250 in 1886.

Hickman County was established in 1821 as the 71st county in Kentucky. Originally, the county made up the entire Kentucky part of the Jackson Purchase. The county was named in honor of Captain Paschal Hickman, who served in many campaigns against the Indians *(10)*. The town of Columbus was the first county seat. It was proposed as the Capital of the United States after the War of 1812. Clinton, the present county seat, was incorporated in 1831 *(10)*.

Geology, Physiography, Drainage, and Relief

The geologic formations in Carlisle and Hickman Counties are among the youngest in Kentucky. The uplands of both counties are covered with several feet of loess. Underlying the mantle of loess are coastal plain deposits left by a northern extension of the Gulf of Mexico. The gulf waters extended as far north as the southern part of Illinois during the Cretaceous, Tertiary, and Quaternary geologic periods. The coastal plain deposits are made up of varying amounts of quartz gravel, sand, silt, and clay.

Carlisle and Hickman Counties are in the Purchase physiographic region *(3)*. This region has three distinct patterns of relief—nearly level to hilly uplands, gently sloping to very steep uplands, and nearly level and gently sloping bottom land. The nearly level to hilly uplands are characterized by broad flats and narrow ridges having short, smooth side slopes that are slightly dissected by a dendritic drainage pattern. The gently sloping to very steep uplands are characterized by narrow, winding ridges and short to very long, rugged side slopes that are highly dissected by a dendritic drainage pattern. The nearly level and gently sloping bottom land is characterized by wide flood plains and stream terraces along the major streams. The alluvial plains along the Mississippi River consist of natural levees, flats, and long swales that are roughly parallel to the river. The flood plains along the Mississippi River are as much as 3 miles wide.

The survey area has four main watershed systems—Mayfield Creek, Obion Creek, Bayou du Chien Creek, and the Mississippi River. Mayfield Creek is the county line between Carlisle and Ballard Counties and is the northern boundary of the survey area. The Mayfield Creek watershed drains about 80 percent of Carlisle County. Obion Creek is in the central part of the survey area, and its watershed drains about 20 percent of Carlisle County and 65 percent of Hickman County. The Bayou du Chien watershed is in the southern part of the survey area and drains about 35 percent of Hickman County. The Mississippi River is the western boundary

of the two counties, and its watershed drains the entire survey area. Mayfield, Obion, and Bayou du Chien Creeks empty into the Mississippi River.

Elevations in the survey area range from 260 feet above sea level on the bottom land along the Mississippi River in the southwestern part of Hickman County *(17)* to 550 feet on an upland ridge along Kentucky Highway 123 between Bardwell and Berkley in Carlisle County *(20)*.

Farming

Farming is the major economic activity in Carlisle and Hickman Counties. In 1987, the total number of farms was 375 in Carlisle County and 283 in Hickman County. The average size of the farms was 226 acres in Carlisle County and 338 acres in Hickman County. In Carlisle County farmland made up about 84,620 acres, or 69 percent of the land area. In Hickman County farmland made up about 95,560 acres, or 61 percent of the land area.

The main farm commodities in the survey area are grain, dairy products, beef cattle, hogs, hay, and tobacco. In 1988, Carlisle County produced 1,215,000 bushels of corn on 16,200 acres; 465,600 bushels of soybeans on 19,400 acres; 276,000 bushels of wheat on 6,000 acres; 45,600 bushels of milo on 800 acres; and 15,250 tons of hay (all kinds) on 8,800 acres. In the same year Hickman County produced 2,044,500 bushels of corn on 23,500 acres; 962,000 bushels of soybeans on 37,000 acres; 924,000 bushels of wheat on 16,500 acres; 31,500 bushels of milo on 500 acres; and 5,600 tons of hay (all kinds) on 4,000 acres *(15)*.

Natural Resources

The main natural resources in the survey area are soil, water, trees, gravel, sand, and clay.

Soil is the most important natural resource in Carlisle and Hickman Counties. It is used for food production; construction purposes, such as earthen dams and roads; wildlife habitat; recreational purposes; timber production; and sanitary facilities, such as septic tank absorption fields.

Water is an abundant vital resource in the survey area. The largest sources of surface water are the Mississippi River and Mayfield, Obion, and Bayou du Chien Creeks. The Mississippi River, which is the only navigable stream in the survey area, is used for barge traffic. The survey area has enough ground water to meet industrial, domestic, and agricultural needs. Most areas in the two counties can produce an adequate domestic supply of 500 gallons a day.

Trees are an important resource in the survey area. They are used for firewood, pulp for a local paper mill, rough lumber, dimension stock, crossties, chips, cants, and nut crops. In 1982, about 27,300 acres in Carlisle County, or 22 percent of the land area, and 29,800 acres in Hickman County, or 19 percent of the land area, were forested *(18)*.

Unconsolidated deposits of gravel, sand, and clay are throughout the survey area. They generally are covered by a mantle of silt. The gravel and sand are used mainly for construction purposes, such as roads, railroad ballast, building foundations, and concrete. High-grade clay is mined in a few areas. It is used in the manufacture of fine china, porcelain, sanitary hardware, and tile.

How This Survey Was Made

This survey was made to provide information about the soils in the survey area. The information includes a description of the soils and their location and a discussion of the suitability, limitations, and management of the soils for specified uses. Soil scientists observed the steepness, length, and shape of slopes; the general pattern of drainage; the kinds of crops and native plants growing on the soils; and the kinds of bedrock. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

The soils in the survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil is associated with a particular kind of landscape or with a segment of the landscape. By observing the soils in the survey area and relating their position to specific segments of the landscape, a soil scientist develops a concept, or model, of how the soils were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. The system of taxonomic classification used in the United States is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot assure that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Map Unit Composition

A map unit delineation on a soil map represents an area dominated by one major kind of soil or an area dominated by two or three kinds of soil. A map unit is identified and named according to the taxonomic classification of the dominant soil or soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural objects. In common with other natural objects, they have a characteristic variability in their properties. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of soils of other taxonomic classes. Consequently, every map unit is made up of the soil or soils for which it is named and some soils that belong to other taxonomic classes. These latter soils are called inclusions or included soils.

Most inclusions have properties and behavioral patterns similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting (similar) inclusions. They may or may not be mentioned in the map unit descriptions. Other inclusions, however, have properties and behavior divergent enough to affect use or require different management. These are contrasting (dissimilar) inclusions. They generally occupy small areas and cannot be shown separately on the soil maps because of the scale used in mapping. The inclusions of contrasting soils are mentioned in the map unit descriptions. A few inclusions may not have been observed and consequently are not mentioned in the descriptions, especially where the soil pattern was so complex that it was impractical to make enough observations to identify all of the kinds of soil on the landscape.

The presence of inclusions in a map unit in no way diminishes the usefulness or accuracy of the soil data. The objective of soil mapping is not to delineate pure taxonomic classes of soils but rather to separate the landscape into segments that have similar use and management requirements. The delineation of such landscape segments on the map provides sufficient information for the development of resource plans, but onsite investigation is needed to plan for intensive uses in small areas.

General Soil Map Units

The general soil maps at the back of this publication show broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit on the general soil maps is a unique natural landscape. Typically, it consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one unit can occur in another but in a different pattern.

The general soil maps can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the maps. Likewise, areas where the soils are not suitable can be identified.

Because of their small scale, the maps are not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one map unit differ from place to place in slope, depth, drainage, and other characteristics that affect management.

Soil Descriptions for Carlisle County

1. Openlake-Bardwell-Commerce-Robinsonville

Very deep, nearly level, somewhat poorly drained to well drained soils that have a clayey or loamy subsoil; on flood plains

This map unit is in the western part of Carlisle County. It is on long and broad flood plains along the Mississippi River. Slopes range from 0 to 2 percent. Long, narrow, shallow lakes that are parallel to the Mississippi River are interspersed in areas of this map unit. Intermittent streams and drainageways connect to form small creeks and perennial streams. Roads, electric power lines, and farm-related structures are important features.

This map unit makes up about 11 percent of Carlisle County. It is about 29 percent Openlake soils, 17 percent Bardwell soils, 11 percent Commerce soils, 11 percent Robinsonville soils, and 32 percent soils of minor extent (fig. 2).

The Openlake soils are somewhat poorly drained. They formed in clayey alluvium. Typically, the surface layer is very dark grayish brown silty clay. The subsoil is very dark grayish brown and dark gray silty clay and silty clay loam.

The Bardwell soils are well drained. They formed in loamy alluvium. Typically, the surface layer is dark brown silt loam and silty clay loam. The subsoil is brown silty clay loam and yellowish brown, mottled silt loam.

The Commerce soils are somewhat poorly drained. They formed in loamy alluvium. Typically, the surface layer is dark grayish brown silt loam. The subsoil is dark grayish brown and dark gray silty clay loam and silt loam. The substratum is dark gray and dark grayish brown silty clay loam.

The Robinsonville soils are well drained. They formed in loamy alluvium. Typically, the surface layer is dark brown silt loam. The substratum is dark brown and dark yellowish brown loam and very fine sandy loam. Below this is a buried soil of dark brown and dark grayish brown silt loam.

Of minor extent in this map unit are the Keyespoint, Crevasse, Bowdre, and Mhoon soils on flood plains.

Most areas of this map unit have been cleared of trees and are used for row crops, such as soybeans, milo, and corn. Some areas are used for timber production.

If drained and protected from spring flooding, the soils in this map unit are well suited to row crops. They are less well suited to small grain, pasture, and hay because of flooding in winter and spring. The main management concerns are wetness and the hazard of flooding.

The soils in this map unit soils are well suited to woodland. An equipment limitation, seedling mortality, and plant competition are management concerns. The soils are suited to habitat for woodland and wetland wildlife.

Most of the soils in this map unit are poorly suited to urban development. The hazard of flooding, wetness, and restricted permeability are the main limitations affecting residential and other urban uses. Low strength is a limitation on sites for local roads and streets.

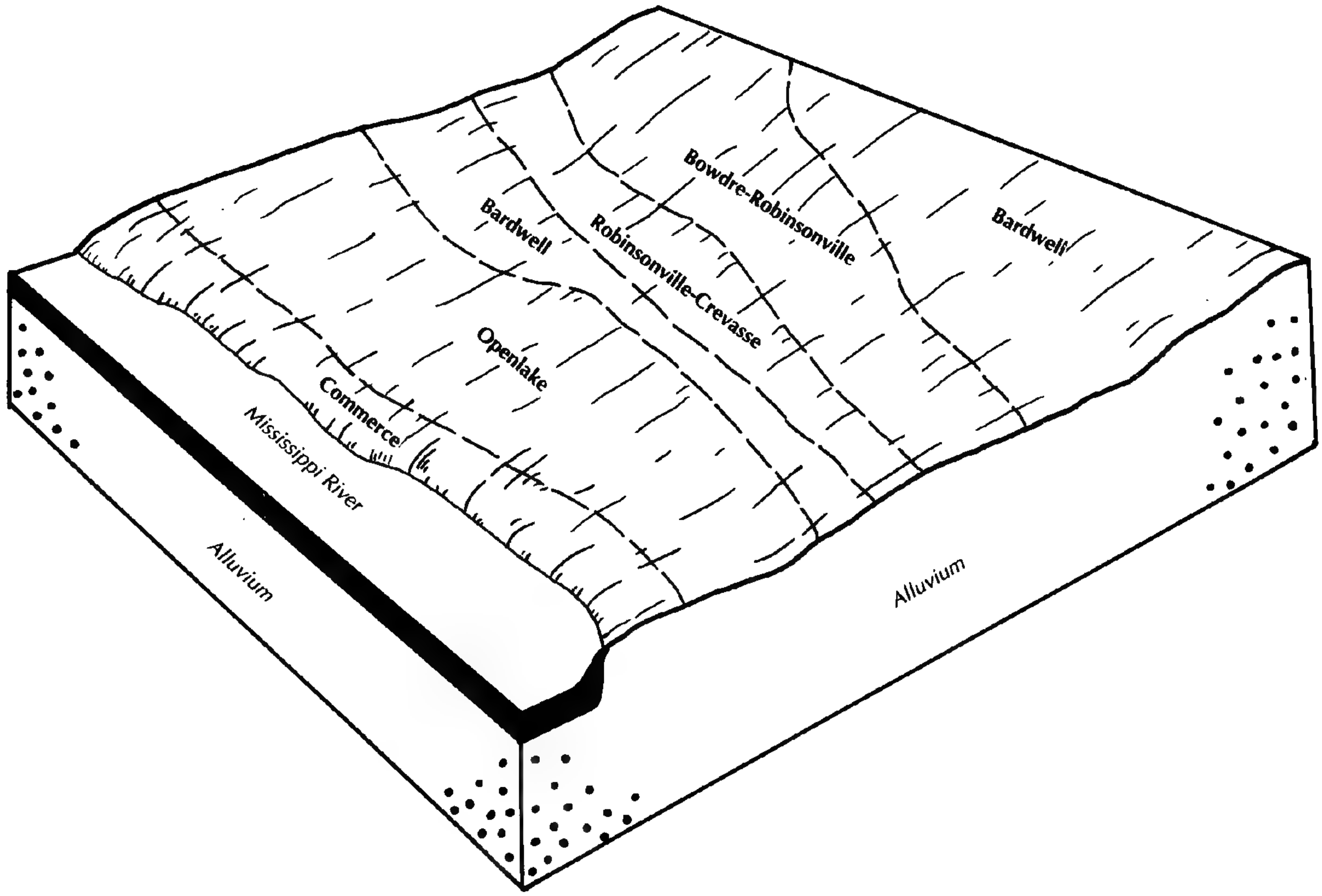

Figure 2.—Relationship of soils to topography and underlying material in the Openlake-Bardwell-Commerce-Robinsonville general soil map unit in Carlisle County.

2. Loring-Memphis

Very deep, gently sloping to steep, moderately well drained and well drained soils that have a loamy subsoil; on upland ridgetops and side slopes

This map unit is dominantly in the eastern part of Carlisle County. The landscape is characterized by long, broad or narrow ridgetops and short or long side slopes that are deeply dissected by intermittent streams. Slopes range from 2 to 40 percent. Urban areas, farm-related structures, farm ponds, watershed structures, and electric power lines are important features. The city of Bardwell and the communities of Arlington and Milburn are in areas of this map unit.

This map unit makes up about 46 percent of Carlisle County. It is about 67 percent Loring soils, 10 percent Memphis soils, and 23 percent soils of minor extent (fig. 3).

The Loring soils are on gently sloping and sloping ridgetops and moderately steep and steep side slopes. They are moderately well drained. They formed in loess. Typically, the surface layer is dark brown silt loam. The upper part of the subsoil is yellowish brown silt loam. The lower part is a firm, compact, brittle fragipan of strong brown and dark brown, mottled silt loam.

The Memphis soils are on gently sloping and sloping ridgetops and moderately steep and steep side slopes. They are well drained. They formed in loess. Typically, the surface layer is dark brown silt loam. The subsoil is strong brown and brown silty clay loam and silt loam.

Of minor extent in this map unit are the Adler, Convent, and Iuka soils on flood plains and the Calloway and Saffell soils on uplands.

Most areas of this map unit are used for row crops, pasture, hay, or woodland. The steeper areas generally are wooded.

Most of the soils in this map unit are suited to

farming. The gently sloping and sloping soils are well suited to the row crops commonly grown in the survey area. The steeper soils are better suited to hay, pasture, and woodland. The main management concerns are the hazard of erosion, the slope, and a moderately deep root zone. Wetness and the hazard of flooding are management concerns in areas of the minor soils on flood plains.

The soils in this map unit are well suited to woodland. The hazard of erosion, an equipment limitation, seedling mortality, and plant competition are management concerns. The soils are well suited to habitat for woodland wildlife.

The soils in this map unit are poorly suited to most urban uses. The slope and wetness are the main limitations. Low strength is a limitation on sites for local roads and streets.

3. Loring-Adler

Very deep, moderately steep to nearly level, moderately well drained soils that have a loamy subsoil; on upland ridgetops and side slopes and on narrow flood plains

This map unit is dominantly in the northern and eastern parts of Carlisle County. The landscape is characterized by long, broad ridgetops; short or long side slopes; and narrow flood plains. Slopes range from 0 to 20 percent. Urban areas, small communities,

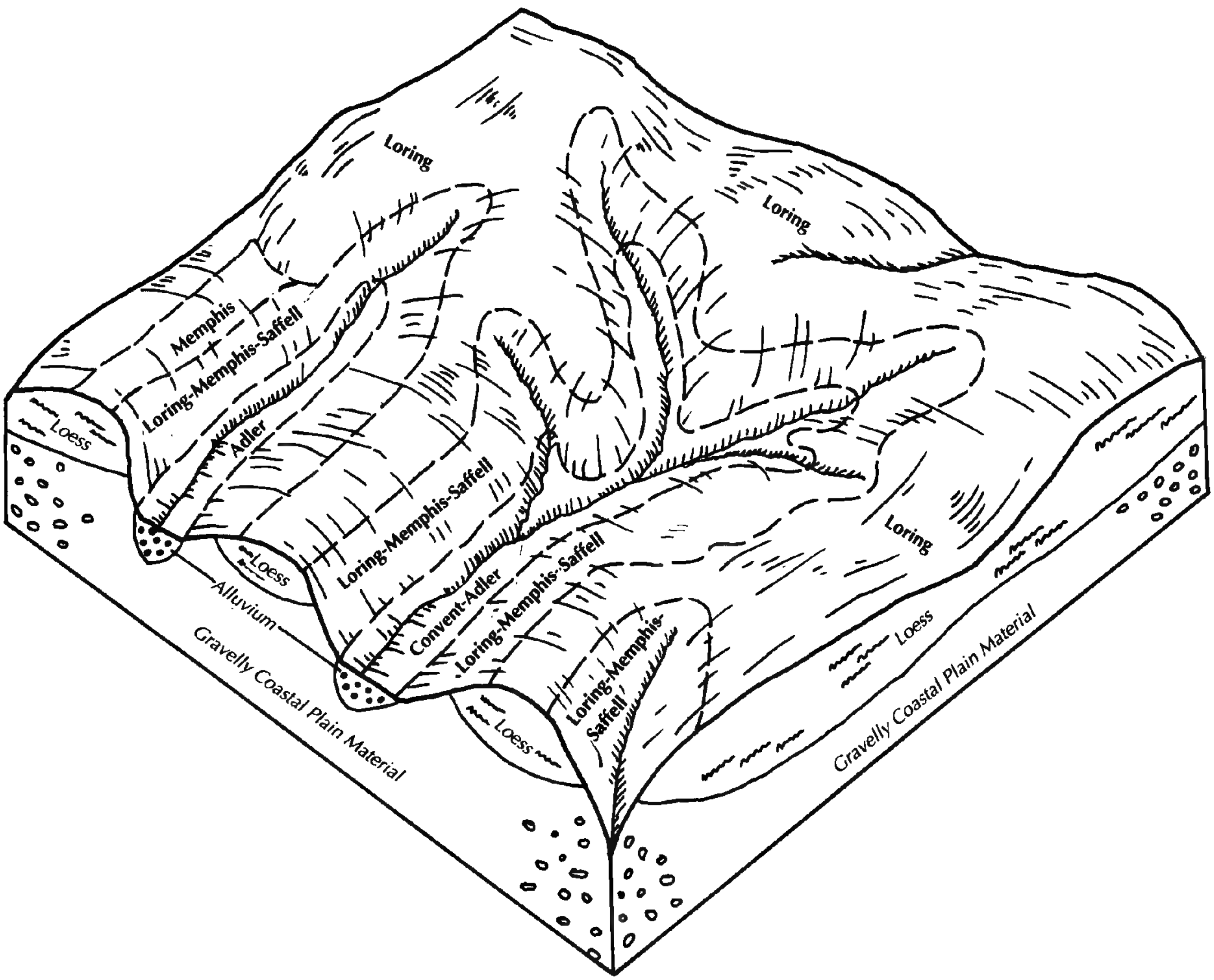

Figure 3.—Relationship of soils to topography and underlying material in the Loring-Memphis general soil map unit in Carlisle and Hickman Counties.

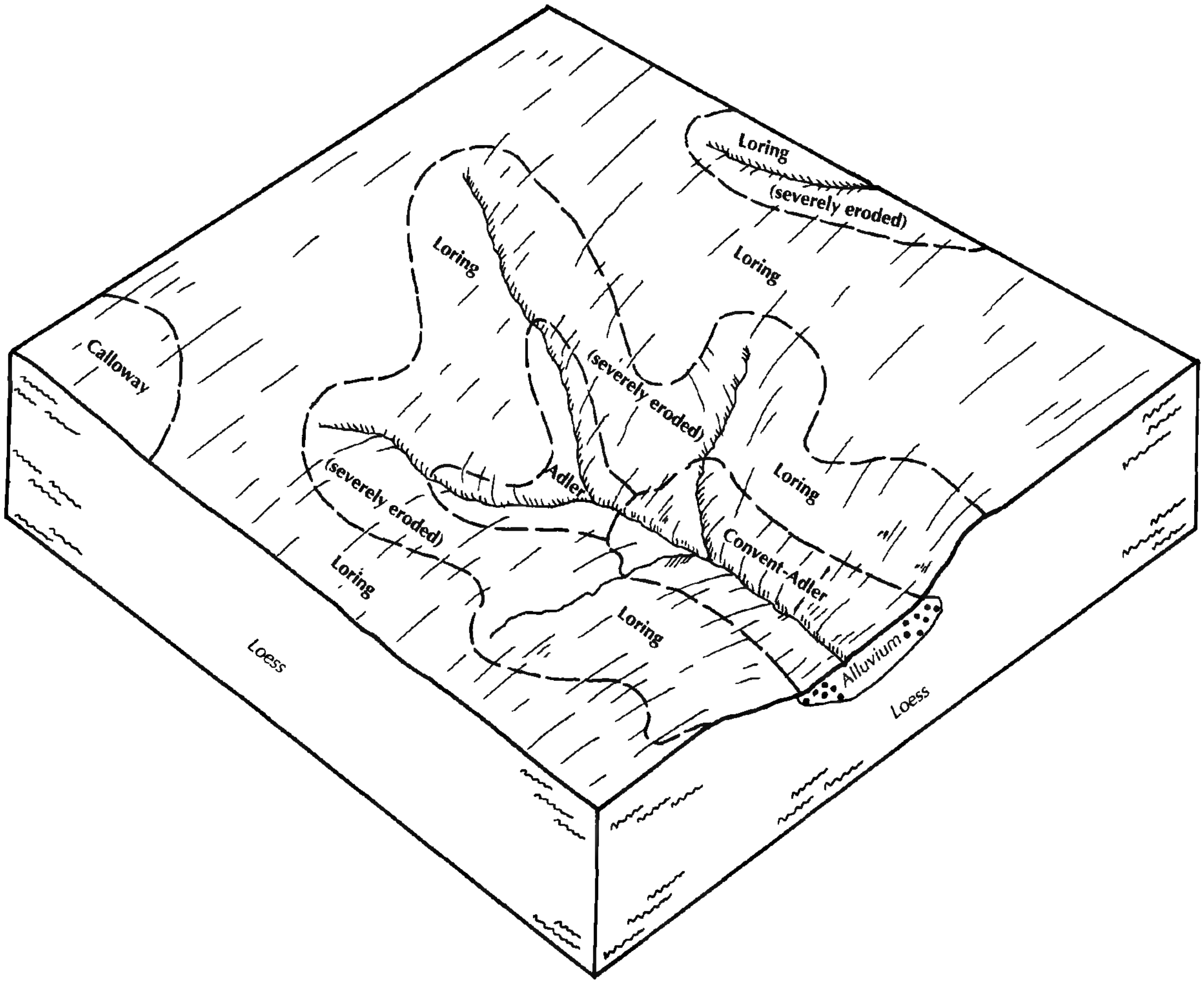

Figure 4.—Relationship of soils to topography and underlying material in the Loring-Adler general soil map unit in Carlisle and Hickman Counties.

dwellings, farm-related structures, roads, railroads, gas transmission lines, and electric power lines are important features. Berkley and Cunningham are small communities in areas of this map unit.

This map unit makes up about 17 percent of Carlisle County. It is about 78 percent Loring soils, 10 percent Adler soils, and 12 percent soils of minor extent (fig. 4).

The Loring soils are on gently sloping and sloping ridgetops and moderately steep side slopes. They formed in loess. Typically, the surface layer is dark brown silt loam. The upper part of the subsoil is yellowish brown silt loam. The lower part is a firm, compact, brittle fragipan of strong brown and dark brown, mottled silt loam.

The Adler soils are on nearly level flood plains. They formed in loamy alluvium. Typically, the surface layer is dark yellowish brown silt loam and silt. The substratum is brown and dark yellowish brown, mottled silt loam and silt. Below this is a buried soil of dark brown, very dark grayish brown, and grayish brown, mottled silt loam.

Of minor extent in this map unit are the Memphis and Saffell soils on uplands, the Calloway soils on uplands and stream terraces, the Center and Routon soils on stream terraces, and the Convent and Mhoon soils on flood plains.

Most areas of this map unit have been cleared of trees and are used for row crops, hay, or pasture.

The steeper areas generally are wooded.

The soils in this map unit are well suited to farming. The gently sloping and sloping soils on uplands and the nearly level soils on flood plains are well suited to the row crops commonly grown in the survey area. The main management concerns are the hazard of erosion, the slope, and a moderately deep root zone. Wetness and the hazard of flooding are limitations in areas of the soils on flood plains.

The soils in this map unit are well suited to woodland. The hazard of erosion, an equipment limitation, seedling mortality, and plant competition are management concerns. The soils are well suited to habitat for woodland wildlife.

Most of the soils in this map unit are suited to urban development. The slope, wetness, restricted permeability, and the hazard of flooding in the areas on flood plains are the main management concerns. Low strength is a limitation on sites for local roads and streets.

4. Convent-Adler-Mhoon

Very deep, nearly level, moderately well drained to poorly drained soils that have a loamy subsoil; on flood plains

This map unit is on long, narrow or wide flood plains along the major streams throughout Carlisle County. Slopes range from 0 to 2 percent. Numerous drainageways and intermittent streams connect to form small creeks and perennial streams. Farmsteads, roads, railroads, gas transmission lines, and electric power lines are important features.

This map unit makes up about 22 percent of Carlisle County. It is about 32 percent Convent soils, 24 percent Adler soils, 13 percent Mhoon soils, and 31 percent soils of minor extent (fig. 5).

The Convent soils are somewhat poorly drained. They formed in loamy alluvium. Typically, the surface layer is dark brown silt loam. The subsurface layer is dark brown, mottled silt loam. The subsoil is grayish brown and light brownish gray, mottled silt loam.

The Adler soils are moderately well drained. They formed in loamy alluvium. Typically, the surface layer is dark yellowish brown silt loam and silt. The substratum is brown and dark yellowish brown, mottled silt loam and silt. Below this is a buried soil of dark brown, very dark grayish brown, and grayish brown, mottled silt loam.

The Mhoon soils are poorly drained. In some areas they are ponded throughout most of the year. They formed in loamy alluvium. Typically, the surface layer is dark grayish brown silt loam. The subsoil is gray, mottled silt loam.

Of minor extent in this map unit are the Calloway, Center, and Routon soils on low stream terraces and the Dekoven and Iuka soils on flood plains.

Most areas of this map unit have been cleared of trees and are used for row crops. A few areas are used for pasture or hay. Many areas are used for timber production. Ponded areas are used primarily as habitat for wetland wildlife.

If drained and protected from spring flooding, most of the soils in this map unit are well suited to the cultivated crops commonly grown in the survey area. They are not suited to small grain, pasture, or hay because of flooding in winter and spring. Wetness and the hazard of flooding are the main management concerns.

The soils in this map unit are well suited to woodland. An equipment limitation, seedling mortality, and plant competition are management concerns. The soils are suited to habitat for woodland and wetland wildlife.

The soils in this map unit are poorly suited to most kinds of urban development. The hazard of flooding, wetness, and restricted permeability are the main limitations affecting residential and other urban uses. Low strength is a limitation on sites for local roads and streets.

5. Memphis-Loring-Molena

Very deep, gently sloping to very steep, moderately well drained to somewhat excessively drained soils that have a loamy or sandy subsoil; on upland ridgetops and side slopes

This map unit is in the western part of Carlisle County. The landscape is characterized by long, winding ridgetops and short or long side slopes that are deeply dissected by intermittent streams. Slopes range from 2 to 40 percent. Farmsteads and roads are important features.

This map unit makes up about 4 percent of Carlisle County. It is about 39 percent Memphis soils, 22 percent Loring soils, 10 percent Molena soils, and 29 percent soils of minor extent (fig. 6).

The Memphis soils are on gently sloping and sloping ridgetops and steep and very steep side slopes. They are well drained. They formed in loess. Typically, the surface layer is dark yellowish brown silt loam. The subsoil is brown and strong brown silty clay loam and silt loam.

The Loring soils are on gently sloping and sloping ridgetops and moderately steep and steep hillsides. They are moderately well drained. They formed in loess. Typically, the surface layer is dark yellowish brown silt loam. The upper part of the subsoil is yellowish brown silt loam. The lower part is a firm,

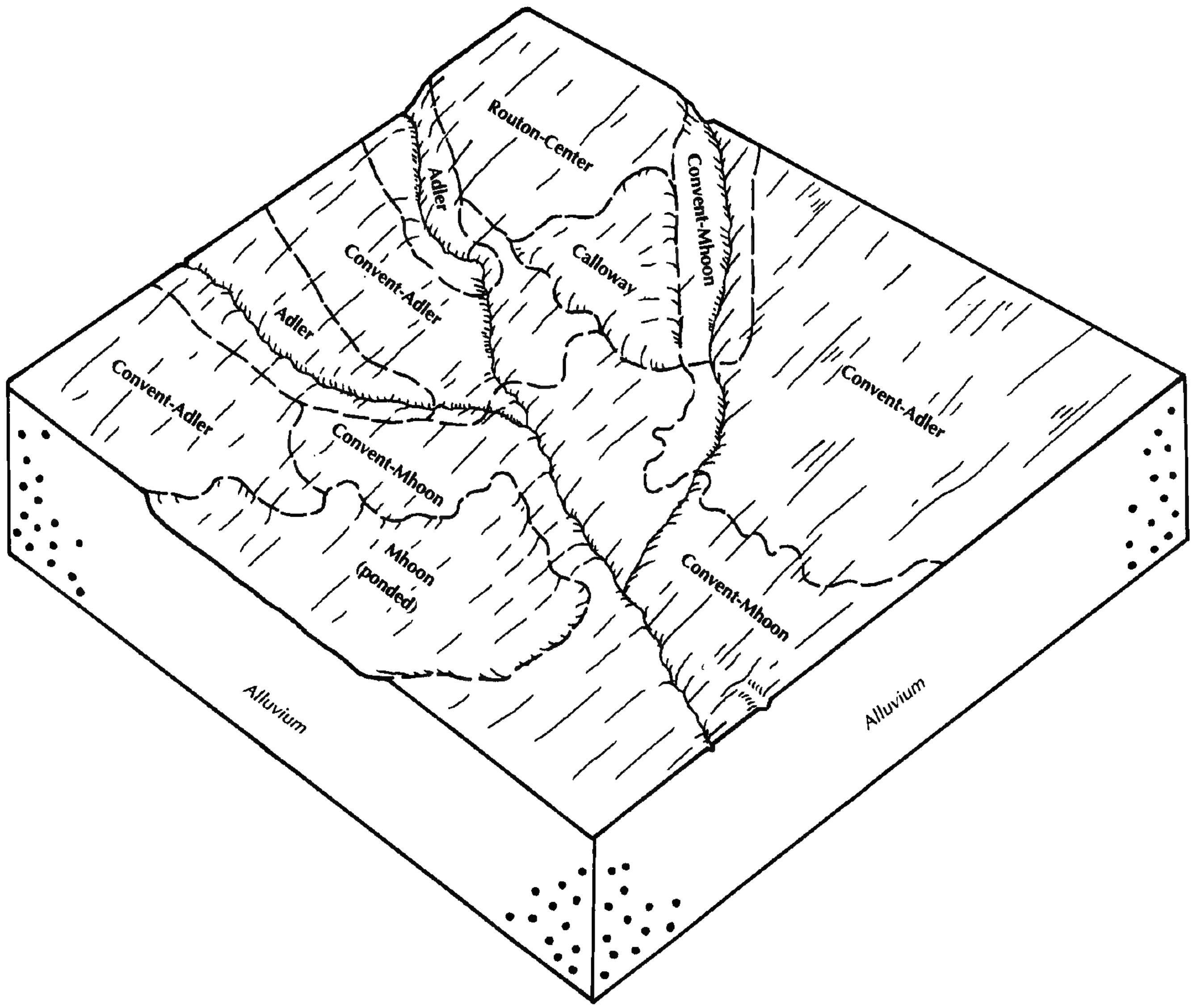

Figure 5.—Relationship of soils to topography and underlying material in the Convent-Adler-Mhoon general soil map unit in Carlisle County.

compact, brittle fragipan of yellowish brown and dark yellowish brown, mottled silt loam.

The Molena soils are on steep and very steep hillsides. They are somewhat excessively drained. They formed in coastal plain sediments. Typically, the surface layer is very dark grayish brown loamy sand. The next layer is dark brown loamy sand and yellowish brown sand. The subsoil is yellowish brown and strong brown loamy sand that has lamellae of fine sandy loam.

Of minor extent in this map unit are the Saffell soils on uplands and the Adler and Iuka soils on narrow flood plains.

Most areas of this map unit are used as woodland. Some areas on ridges have been cleared of trees and are used for pasture, hay, or row crops.

The soils in this map unit generally are not suited to farming. If protected from erosion, however, the gently sloping and sloping soils on ridgetops are suited to cultivated crops, pasture, and hay. The hazard of erosion and the steepness and instability of slopes are the main management concerns.

The soils in this map unit are suited to woodland. The hazard of erosion, an equipment limitation, plant competition, and seedling mortality are management concerns. The soils are suited to habitat for woodland wildlife.

The soils in this map unit are poorly suited to urban uses. Restricted permeability, wetness, caving of excavated banks, and the slope are the main limitations. Low strength is a limitation on sites for local roads and streets.

Soil Descriptions for Hickman County

1. Openlake-Commerce-Bardwell

Very deep, nearly level, somewhat poorly drained and well drained soils that have a clayey or loamy subsoil; on flood plains

This map unit is on long and broad flood plains along the Mississippi River. Slopes range from 0 to 2 percent. Long, narrow, shallow lakes that are parallel to the Mississippi River are interspersed in areas of this unit. Intermittent streams and drainageways connect to form small creeks and perennial streams. Farmsteads, roads, and the shallow lakes are important features.

This map unit makes up about 9 percent of Hickman County. It is about 33 percent Openlake soils, 16 percent Commerce soils, 14 percent Bardwell soils, and 37 percent soils of minor extent (fig. 7).

The Openlake soils are somewhat poorly drained. They formed in clayey alluvium. Typically, the surface layer is very dark grayish brown silty clay. The subsoil is very dark grayish brown and dark gray silty clay and silty clay loam.

The Commerce soils are somewhat poorly drained. They formed in loamy alluvium. Typically, the surface layer is dark grayish brown silt loam. The subsoil is dark grayish brown and dark gray silty clay loam and

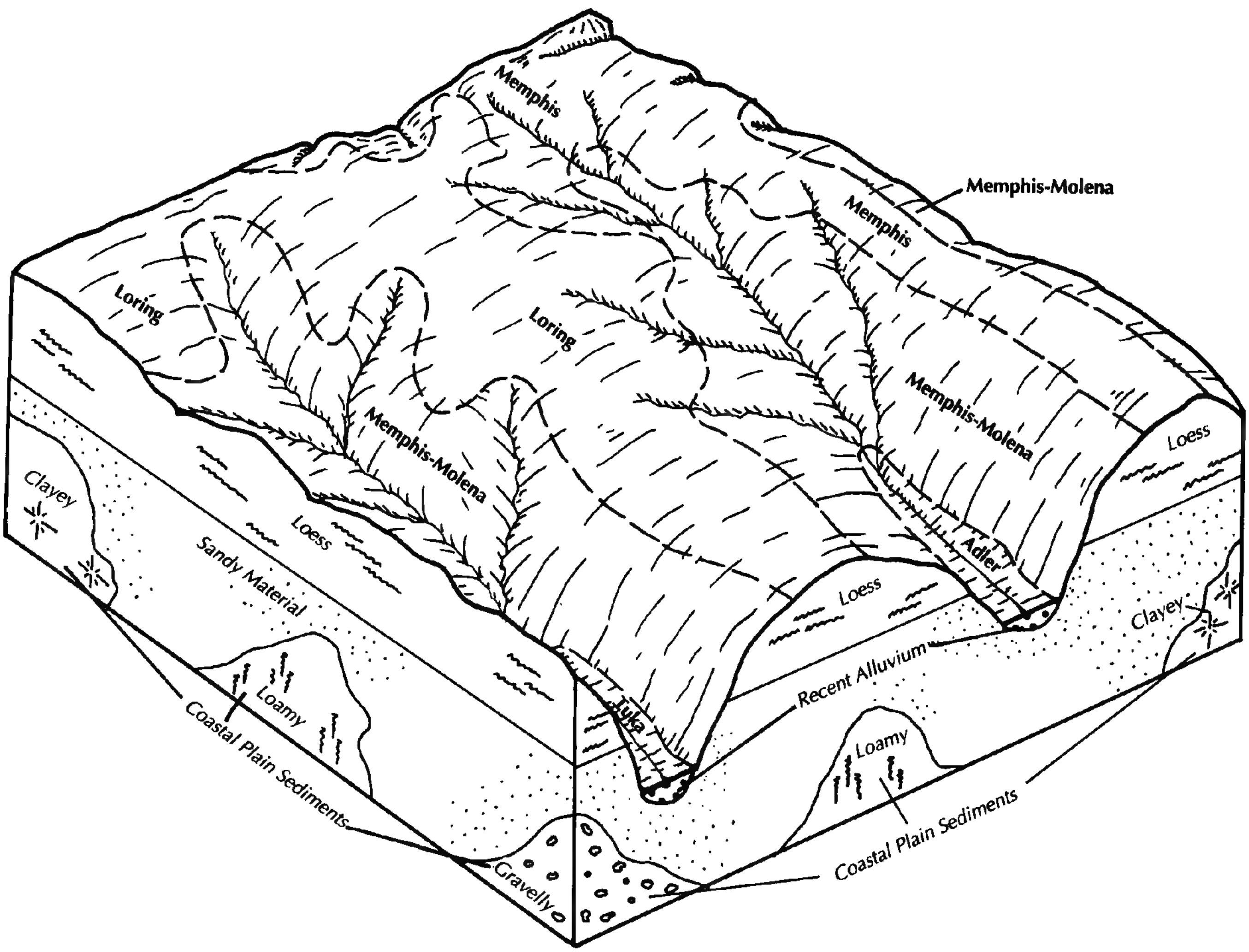

Figure 6.—Relationship of soils to topography and underlying material in the Memphis-Loring-Molena general soil map unit in Carlisle County.

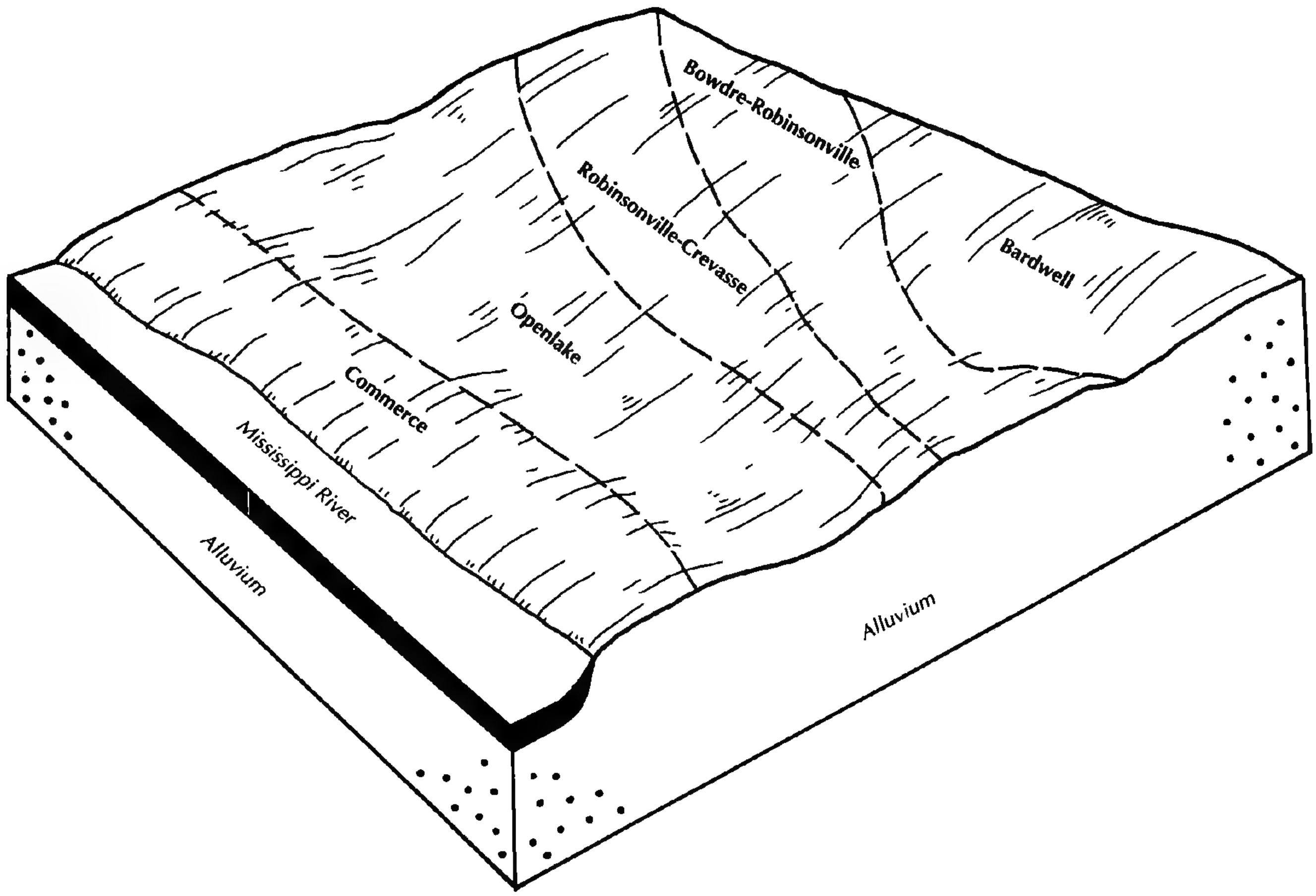

Figure 7.—Relationship of soils to topography and underlying material in the Openlake-Commerce-Bardwell general soil map unit in Hickman County.

silt loam. The substratum is dark gray and dark grayish brown silty clay loam.

The Bardwell soils are well drained. They formed in loamy alluvium. Typically, the surface layer is dark brown silt loam and silty clay loam. The subsoil is brown silty clay loam and yellowish brown, mottled silt loam.

Of minor extent in this map unit are the Keyespoint, Crevasse, Bowdre, Mhoon, and Robinsonville soils on flood plains.

Most areas of this map unit have been cleared of trees and are used for row crops, such as soybeans, milo, and corn. Some areas are used for timber production.

If drained and protected from spring flooding, the soils in this map unit are well suited to row crops. They are less well suited to small grain, pasture, and hay because of flooding in winter and spring. The main management concerns are wetness and the hazard of flooding.

The soils in this map unit are well suited to woodland. An equipment limitation, seedling mortality, and plant competition are management concerns. The soils are suited to habitat for woodland and wetland wildlife.

Most of the soils in this map unit are poorly suited to urban development. The hazard of flooding, wetness, and restricted permeability are the main limitations affecting residential and other urban uses. Low strength is a limitation on sites for local roads and streets.

2. Loring-Memphis

Very deep, gently sloping to steep, moderately well drained and well drained soils that have a loamy subsoil; on upland ridgetops and side slopes

This map unit is dominantly in the central part of Hickman County. The landscape is characterized by long, broad or narrow ridgetops and short or long side slopes that are deeply dissected by intermittent streams. Slopes range from 2 to 40 percent. Small communities, farmsteads, farm ponds, watershed

structures, roads, railroads, gas transmission lines, and electric power lines are important features. The towns of Columbus, Clinton, and Fulgham are in areas of this map unit.

This map unit makes up about 20 percent of Hickman County. It is about 76 percent Loring soils, 10 percent Memphis soils, and 14 percent soils of minor extent (fig. 3).

The Loring soils are on gently sloping and sloping ridgetops and moderately steep and steep side slopes. They are moderately well drained. They formed in loess. Typically, the surface layer is dark brown silt loam. The upper part of the subsoil is yellowish brown silt loam. The lower part is a firm, compact, brittle fragipan of strong brown and dark brown, mottled silt loam.

The Memphis soils are on gently sloping and sloping ridgetops and moderately steep and steep side slopes. They are well drained. They formed in loess. Typically, the surface layer is dark brown silt loam. The subsoil is dark brown silty clay loam and silt loam.

Of minor extent in this map unit are the Adler and Convent soils on flood plains and the Calloway and Saffell soils on uplands.

This map unit is used for row crops, pasture, hay, or woodland. The steeper areas generally are wooded.

Most of the soils in this map unit are suited to farming. The gently sloping and sloping soils are suited to the row crops commonly grown in the survey area. The steeper soils are better suited to hay, pasture, and woodland. The main management concerns are the hazard of erosion, the slope, and a moderately deep root zone. Wetness and the hazard of flooding are management concerns in areas of the minor soils on flood plains.

The soils in this map unit are well suited to woodland. The hazard of erosion, an equipment limitation, seedling mortality, and plant competition are management concerns. The soils are well suited to habitat for woodland wildlife.

The soils in this map unit are poorly suited to urban uses. The slope and wetness are the main limitations. Low strength is a limitation on sites for local roads and streets.

3. Loring-Adler

Very deep, moderately steep to nearly level, moderately well drained soils that have a loamy subsoil; on upland ridgetops and side slopes and on narrow flood plains

This map unit is dominantly in the northern and southern parts of Hickman County. The landscape is characterized by long, broad ridgetops; short or long side slopes; and narrow flood plains. Slopes range from 0 to 20 percent. Urban areas, small communities, dwellings, farm-related structures, roads, railroads, gas transmission lines, and electric power lines are important features.

This map unit makes up about 33 percent of Hickman County. It is about 79 percent Loring soils, 7 percent Adler soils, and 14 percent soils of minor extent (fig. 4).

The Loring soils are on gently sloping and sloping ridgetops and moderately steep side slopes. They formed in loess. Typically, the surface layer is dark brown silt loam. The upper part of the subsoil is yellowish brown silt loam. The lower part is a firm, compact, brittle fragipan of strong brown and dark brown, mottled silt loam.

The Adler soils are on nearly level flood plains. They formed in loamy alluvium. Typically, the surface layer is dark yellowish brown silt loam and silt. The substratum is brown and dark yellowish brown, mottled silt loam. Below this is a buried soil of dark brown, very dark grayish brown, and grayish brown, mottled silt loam.

Of minor extent in this map unit are the Calloway soils on uplands; the Calloway, Center, and Routon soils on stream terraces; and the Convent and Mhoon soils on flood plains.

Most areas of this map unit have been cleared of trees and are used for row crops, hay, or pasture. The steeper areas generally are wooded.

The soils in this map unit are well suited to farming. The gently sloping and sloping soils on uplands and the nearly level soils on flood plains are well suited to the row crops commonly grown in the survey area. The main management concerns are the hazard of erosion, the slope, and a moderately deep root zone. Wetness and the hazard of flooding are limitations in areas of the soils on flood plains.

The soils in this map unit are well suited to woodland. The hazard of erosion, an equipment limitation, seedling mortality, and plant competition are management concerns. The soils are well suited to habitat for woodland wildlife.

Most of the soils in this map unit are suited to urban uses. The slope, wetness, restricted permeability, and the hazard of flooding in the areas on flood plains are the main management concerns. Low strength is a limitation on sites for local roads and streets.

4. Convent-Adler-Mhoon

Very deep, nearly level, moderately well drained to poorly drained soils that have a loamy subsoil; on flood plains

This map unit is on long, narrow or wide flood plains along the major streams throughout Hickman County.

Slopes range from 0 to 2 percent. Numerous drainageways and intermittent streams connect to form small creeks and perennial streams. Farmsteads, roads, railroads, gas transmission lines, and electric power lines are important features.

This map unit makes up about 33 percent of Hickman County. It is about 24 percent Convent soils, 20 percent Adler soils, 11 percent Mhoon soils, and 45 percent soils of minor extent (fig. 8).

The Convent soils are somewhat poorly drained. They formed in loamy alluvium. Typically, the surface layer is dark brown silt loam. The subsurface layer is dark brown, mottled silt loam. The subsoil is grayish brown and light brownish gray, mottled silt loam.

The Adler soils are moderately well drained. They formed in loamy alluvium. Typically, the surface layer is dark yellowish brown silt loam and silt. The substratum is brown and dark yellowish brown, mottled silt loam. Below this is a buried soil of dark brown, very dark grayish brown, and grayish brown, mottled silt loam.

The Mhoon soils are poorly drained. In some areas they are ponded throughout most of the year. They formed in loamy alluvium. Typically, the surface layer is dark grayish brown silt loam. The subsoil is gray, mottled silt loam.

Of minor extent in this map unit are the Calloway,

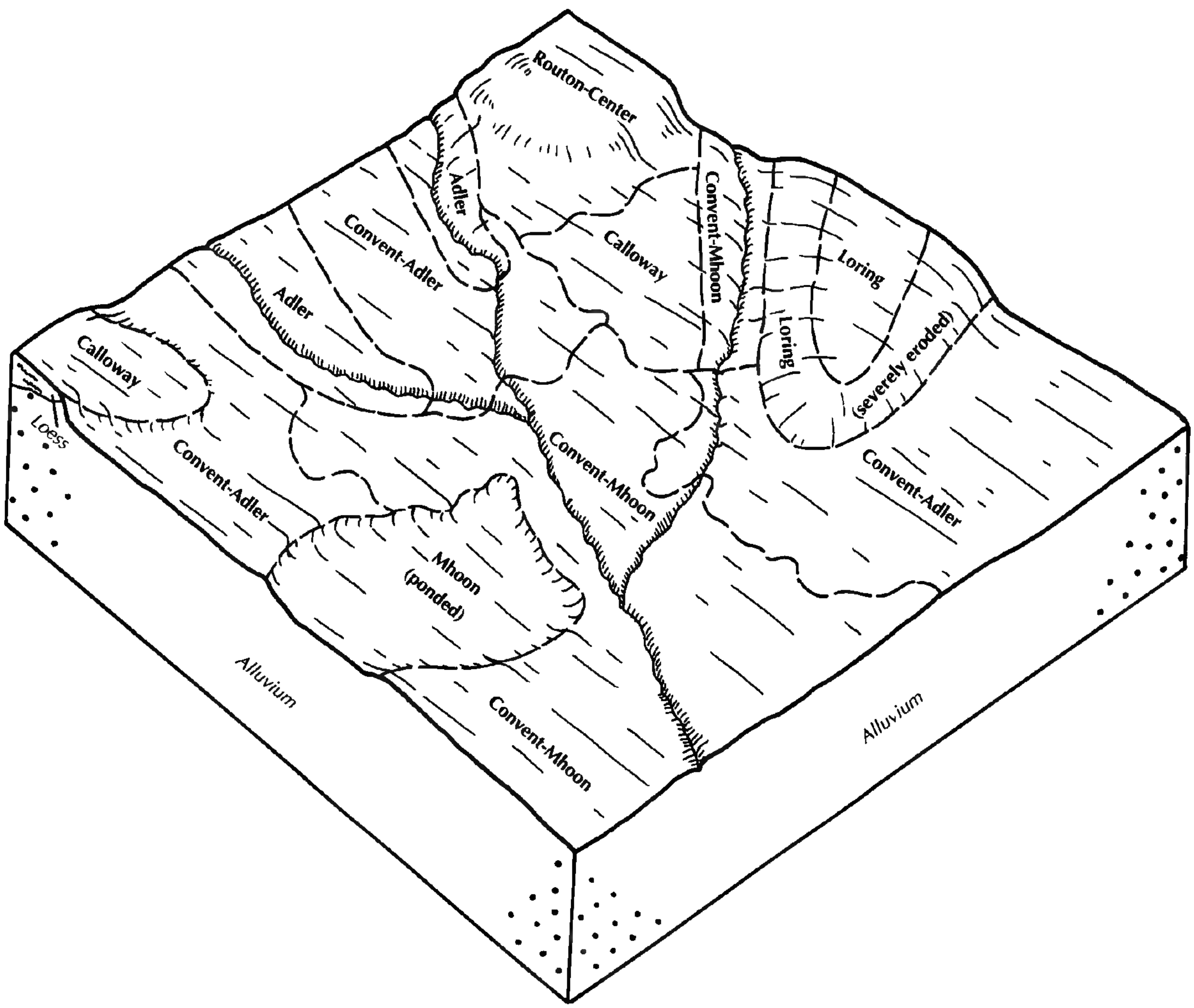

Figure 8.—Relationship of soils to topography and underlying material in the Convent-Adler-Mhoon general soil map unit in Hickman County.

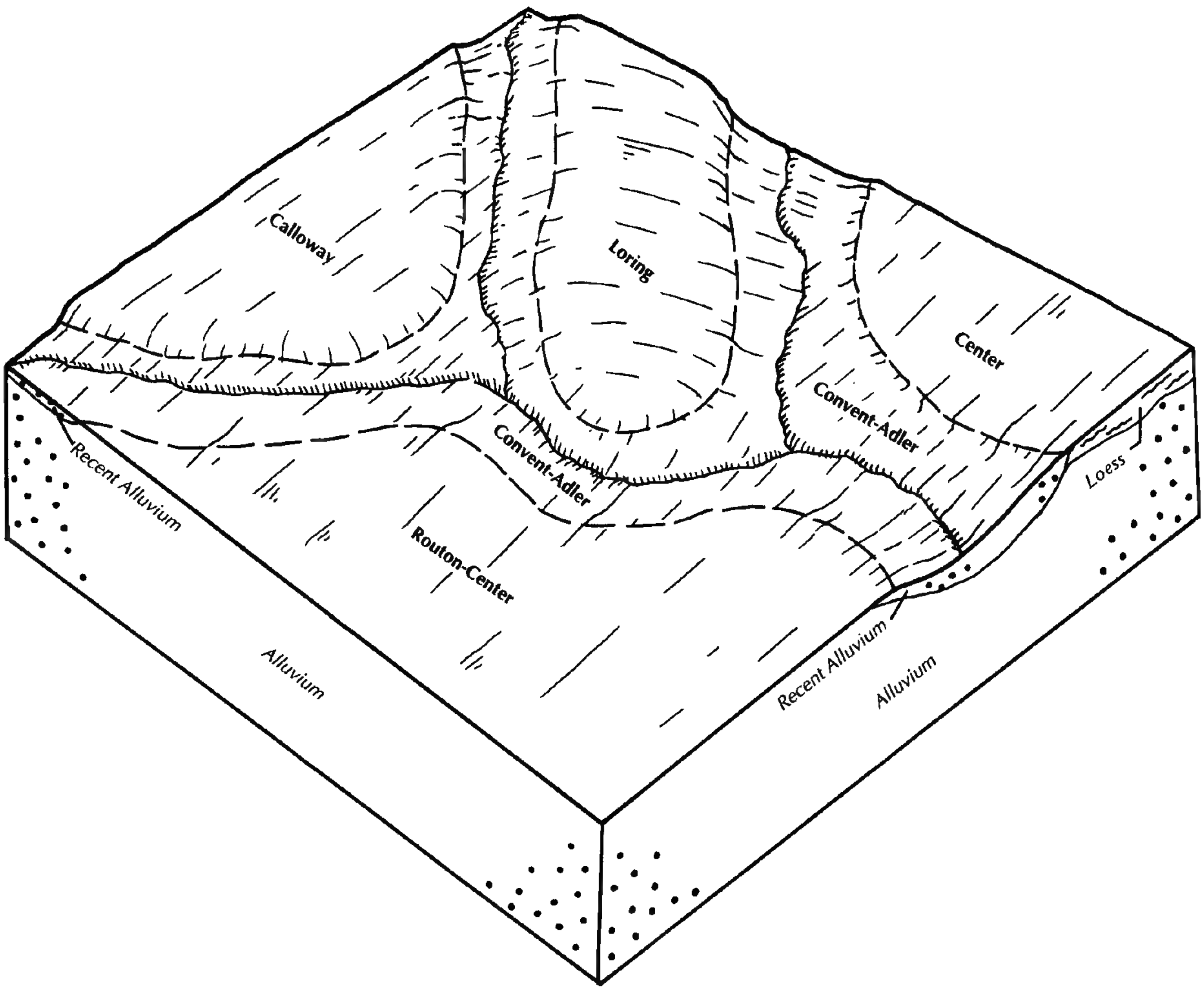

Figure 9.—Relationship of soils to topography and underlying material in the Routon-Calloway-Convent-Loring general soil map unit in Hickman County.

Center, and Routon soils on low stream terraces; the Loring soils on uplands; and the Dekoven and Iuka soils on flood plains.

Most areas of this map unit have been cleared of trees and are used for row crops. A few areas are used for pasture or hay. Many areas are used for timber production. Ponded areas are used primarily as habitat for wetland wildlife.

If drained and protected from spring flooding, most of the soils in this map unit are well suited to the cultivated crops commonly grown in the survey area. They are less well suited to small grain, pasture, and hay because of flooding in winter and spring. Wetness and the hazard of flooding are the main management concerns.

The soils in this map unit are well suited to woodland. An equipment limitation, seedling mortality, and plant competition are management concerns. The soils are suited to habitat for woodland and wetland wildlife.

The soils in this map unit are poorly suited to most kinds of urban development. The hazard of flooding, wetness, and restricted permeability are the main limitations affecting residential and other urban uses. Low strength is a limitation on sites for local roads and streets.

5. Routon-Calloway-Convent-Loring

Very deep, nearly level to sloping, poorly drained to moderately well drained soils that have a loamy subsoil; on stream terraces, flood plains, and uplands

This map unit is dominantly in the western part of Hickman County. It is on broad stream terraces, flood plains, and uplands. Slopes range from 0 to 12 percent. Numerous drainageways and intermittent streams connect to form small creeks and perennial streams. Farmsteads, roads, gas transmission lines, and electric power lines are important features.

This map unit makes up about 5 percent of Hickman County. It is about 16 percent Routon soils, 16 percent Calloway soils, 15 percent Convent soils, 13 percent Loring soils, and 40 percent soils of minor extent (fig. 9).

The Routon soils are in nearly level areas on low stream terraces. They are poorly drained. They formed in loamy alluvium. Typically, the surface layer is brown, mottled silt loam. The subsoil is gray, mottled silt loam and light brownish gray, mottled silty clay loam.

The Calloway soils are in nearly level areas on low stream terraces. They are somewhat poorly drained. They formed in loess. Typically, the surface layer is dark brown, mottled silt loam. The upper part of the subsoil is yellowish brown and light yellowish brown, mottled silt loam. The lower part is a firm, compact, brittle fragipan of light brownish gray and yellowish brown, mottled silt loam.

The Convent soils are on nearly level flood plains. They are somewhat poorly drained. They formed in loamy alluvium. Typically, the surface layer is dark brown silt loam. The subsurface layer is dark brown, mottled silt loam. The subsoil is grayish brown silt loam. Below this is a buried subsoil of light brownish gray, mottled silt loam.

The Loring soils are on gently sloping and sloping uplands. They are moderately well drained. They formed in loess. Typically, the surface layer is dark brown silt loam. The upper part of the subsoil is yellowish brown silt loam. The lower part is a firm, compact, brittle fragipan of strong brown and dark brown, mottled silt loam.

Of minor extent in this map unit are the Center soils on low stream terraces and the Adler, Dekoven, and Mhoon soils on flood plains.

Most areas of this map unit have been cleared of trees and are used for row crops, such as corn, soybeans, and milo. A few areas are used for pasture or hay. Some areas are used for timber production.

The soils in this map unit are well suited to row crops. The soils on flood plains are less well suited to small grain, pasture, and hay because of flooding in winter and spring. Wetness and the hazard of flooding are the main management concerns.

The soils in this map unit are well suited to woodland. An equipment limitation, seedling mortality, and plant competition are management concerns. The soils are suited to habitat for woodland and wetland wildlife.

Most of the soils in this map unit are poorly suited to urban development. Wetness, restricted permeability, and the hazard of flooding are the main limitations affecting residential and other urban uses. Low strength is a limitation on sites for local roads and streets.

Detailed Soil Map Units

The map units on the detailed soil maps at the back of this survey represent the soils in the survey area. The map unit descriptions in this section, along with the soil maps, can be used to determine the suitability and potential of a soil for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit, or soil, is given under the heading "Use and Management of the Soils."

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the unit is named.

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils are rated on the basis of their suitability for various uses. The suitability is expressed as well suited, suited, or poorly suited.

Soils that are *well suited* have favorable properties for the specified use. Limitations can be easily overcome. Good performance and low maintenance can be expected.

Soils that are *suited* have moderately favorable properties for the selected use. One or more properties make these soils less desirable than well suited soils.

Soils that are *poorly suited* have one or more properties that are unfavorable for the selected use. Overcoming the limitations requires special design, extra maintenance, or costly operation.

Soils that have profiles that are almost alike make up a *soil series.* Except for differences in texture of the surface layer or of the substratum, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the substratum. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases.* Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Loring silt loam, 6 to 12 percent slopes, eroded, is a phase of the Loring series.

Some map units are made up of two or more major soils. These map units are called complexes or undifferentiated groups.

A *soil complex* consists of two or more soils in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Convent-Adler silt loams, frequently flooded, is an example.

An *undifferentiated group* is made up of two or more soils that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils in the mapped areas are not uniform. An area can be made up of only one of the major soils, or it can be made up of all of them. Keyespoint and Bardwell soils, frequently flooded, is an undifferentiated group in this survey area.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some of these included soils have properties that differ substantially from those of the major soil or soils. Such differences could significantly affect use and management of the soils in the map unit. The included soils are identified in each map unit description. Some small areas of strongly contrasting soils are identified by a special symbol on the soil maps.

This survey includes *miscellaneous areas.* Such areas have little or no soil material and support little or no vegetation. Pits-Dumps complex is an example. Miscellaneous areas are shown on the soil maps. Some that are too small to be shown are identified by a special symbol on the soil maps.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of Tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils.

Soil Descriptions

Ad—Adler silt loam, frequently flooded. This very deep, moderately well drained, nearly level soil is on flood plains throughout the survey area. Individual areas range from 5 to more than 200 acres in size.

Typically, the surface layer is about 11 inches thick. It is dark yellowish brown. It is silt loam in the upper part and mottled silt in the lower part. The substratum, from a depth of 11 to 27 inches, is brown, mottled silt loam in the upper part and dark yellowish brown, mottled silt in the lower part. Below this is a buried surface layer, from a depth of 27 to 38 inches. This layer is dark brown, mottled silt loam in the upper part and very dark grayish brown silt loam in the lower part. The buried subsoil, from a depth of 38 to 60 inches, is dark brown, mottled silt loam in the upper part and grayish brown and dark grayish brown silt loam in the lower part.

This soil is low or moderate in content of organic matter. Permeability is moderate, and the available water capacity is high. Tilth is good, and the soil can be worked throughout a wide range in moisture content without excessive clodding and crusting. Depth to the seasonal high water table ranges from 24 to 36 inches. The root zone is very deep and can be easily penetrated by plant roots. The soil is frequently flooded for brief periods in winter and spring.

Included with this soil in mapping are small areas of Convent and Mhoon soils. These soils are in landscape positions similar to those of the Adler soil. Also included are small areas of Center, Routon, and Calloway soils on low stream terraces; small areas of soils that are similar to the Adler soil but have a firm, compact, brittle layer at a depth of about 2 to 3 feet; and areas where slopes range from 2 to 5 percent. Included soils make up less than 15 percent of this map unit, and individual areas of the included soils generally are less than 3 acres in size.

Most areas are used for row crops, such as soybeans, milo, and corn. A few areas are wooded.

This soil is well suited to the cultivated crops commonly grown in the survey area. It is not suited to small grain because of the hazard of flooding. Returning crop residue to the soil, establishing cover crops, and including grasses and legumes in the cropping sequence help to maintain desirable soil structure, improve tilth, and increase the content of organic matter. In some years crops are damaged by flooding.

If protected from flooding, this soil is well suited to pasture and hay. Applying fertilizer, controlling weeds, brush, and grazing, and properly establishing the plants increase forage production.

This soil is suited to woodland. Bottom-land oaks, green ash, and sweetgum are some of the native trees. The species that are preferred for planting include green ash, eastern cottonwood, yellow-poplar, cherrybark oak, sweetgum, and American sycamore. Table 7 provides specific information relating to potential productivity.

The main concerns in managing woodland are an equipment limitation, seedling mortality, and plant competition. The seasonal high water table restricts the use of equipment to periods when the soil is dry. The seedling mortality rate may be high in areas that are subject to flooding. Without intensive site preparation and maintenance, undesirable plants hinder natural or artificial reforestation.

This soil is well suited to habitat for woodland wildlife.

This soil is poorly suited to most urban uses and sanitary facilities, including septic tank absorption fields, because of the hazard of flooding and the wetness.

The capability subclass is IIw.

Bd—Bardwell silt loam, frequently flooded. This very deep, well drained, nearly level soil is on flood plains along the Mississippi River. Individual areas range from 10 to 150 acres in size.

Typically, the surface layer is about 17 inches thick. It is dark brown. It is silt loam in the upper part and silty clay loam in the lower part. The subsoil extends to a depth of about 60 inches. It is brown silty clay loam in the upper part and yellowish brown, mottled silt loam in the lower part.

This soil is high in content of organic matter. Permeability is moderate, and the available water capacity is high. Tilth is good, and the soil can be worked throughout a wide range in moisture content without excessive clodding and crusting. Depth to the seasonal high water table ranges from 3 to 6 feet. The root zone is very deep and can be easily penetrated by plant roots. The soil is frequently flooded for brief or long periods in winter and spring.

Included with this soil in mapping are small areas of Commerce, Mhoon, Openlake, Robinsonville, and Crevasse soils. These soils are in landscape positions similar to those of the Bardwell soil. Also included are small areas of soils on steep riverbanks, soils that are similar to the Bardwell soil but have a light colored surface layer and contain more than 15 percent fine sand, and areas where slopes range from 2 to 4 percent. Included soils make up less than 20 percent of this map unit, and individual areas of the included soils generally are less than 3 acres in size.

Most areas are used for row crops, such as corn, soybeans, and milo. Some areas are wooded. This soil generally is not used for pasture or hay.

This soil is well suited to the cultivated crops

commonly grown in the survey area. It is not suited to small grain because of the hazard of flooding. Returning crop residue to the soil, establishing cover crops, and including grasses and legumes in the cropping sequence help to maintain desirable soil structure, improve tilth, and increase the content of organic matter. In some years crops are damaged by flooding. The frequent flooding in winter and spring restricts the suitability for pasture and hay.

This soil is well suited to woodland. The species that are preferred for planting include green ash, sweetgum, cherrybark oak, yellow-poplar, black walnut, and pecan. Table 7 provides specific information relating to potential productivity.

The main concern in managing woodland is plant competition. Without intensive site preparation and maintenance, undesirable plants hinder natural or artificial reforestation.

This soil is well suited to habitat for woodland wildlife.

This soil is poorly suited to most urban uses and sanitary facilities, including septic tank absorption fields, because of the hazard of flooding.

The capability subclass is IIIw.

Br—Bowdre-Robinsonville complex, frequently flooded. These very deep, somewhat poorly drained and well drained, nearly level soils are on flood plains along the Mississippi River. The two soils occur as areas so intricately mixed or so small that they could not be mapped separately at the selected scale. Individual areas range from 10 to more than 100 acres in size.

Bowdre silty clay loam makes up about 40 percent of this map unit, and Robinsonville silt loam makes up about 35 percent. Other soils make up about 25 percent.

Typically, the surface layer of the Bowdre soil is very dark grayish brown silty clay loam about 4 inches thick. The subsoil extends to a depth of about 16 inches. It is very dark grayish brown, mottled silty clay and silty clay loam. The substratum extends to a depth of about 60 inches. It is yellowish brown and brown, mottled fine sandy loam in the upper part and brown, mottled silt loam in the lower part.

The Bowdre soil is moderate in content of organic matter. Permeability is slow in the surface layer and subsoil and moderate in the substratum. The available water capacity is high. Clods form easily in cultivated areas. Tillage within the proper moisture conditions helps to prevent clodding and crusting. Depth to a perched seasonal high water table ranges from 18 to 24 inches. The root zone is very deep and can be easily penetrated by plant roots. The soil is frequently flooded for brief or long periods in winter and spring. The shrink-swell potential is high in the subsoil and low in the substratum.

Typically, the surface layer of the Robinsonville soil is dark brown silt loam about 8 inches thick. The underlying material extends to a depth of about 46 inches. From 8 to 13 inches, it is dark brown loam. From 13 to 46 inches, it is dark brown and dark yellowish brown very fine sandy loam. A buried layer extends from a depth of 46 to 60 inches. It is dark grayish brown and dark brown silt loam.

The Robinsonville soil is low in content of organic matter. Permeability is moderate or moderately rapid, and the available water capacity is high. Tilth is good, and the soil can be worked throughout a wide range in moisture content without excessive clodding and crusting. Depth to the seasonal high water table ranges from 4 to 6 feet. The root zone is very deep and can be easily penetrated by plant roots. The soil is frequently flooded for brief or long periods in winter and spring.

Included with these soils in mapping are small areas of Keyespoint, Openlake, Crevasse, and Commerce soils. These included soils are in landscape positions similar to those of the Bowdre and Robinsonville soils. Also included are small areas of soils on narrow, steep riverbanks and small areas of soils that are similar to the Bowdre and Robinsonville soils but have slopes of 2 to 4 percent. Included soils make up less than 25 percent of this map unit, and individual areas of the included soils generally are less than 3 acres in size.

Most areas are used for row crops, such as soybeans, milo, and corn. A few areas are wooded. This map unit generally is not used for pasture or hay.

These soils are suited to the cultivated crops commonly grown in the survey area. They are not suited to small grain because of the hazard of flooding. In some years crops are damaged by flooding.

These soils are well suited to woodland. Eastern cottonwood, silver maple, and sweetgum are some of the native trees. The species that are preferred for planting include green ash, sweetgum, eastern cottonwood, pecan, and American sycamore. Table 7 provides specific information relating to potential productivity.

The main concerns in managing woodland are an equipment limitation, seedling mortality, and plant competition. The seasonal high water table restricts the use of equipment to periods when the soils are dry. Without intensive site preparation and maintenance, undesirable plants hinder natural or artificial reforestation. The seedling mortality rate may be high in areas that are subject to flooding.

These soils are well suited to habitat for woodland wildlife.

These soils are poorly suited to most urban uses and

sanitary facilities, including septic tank absorption fields, because of the wetness and the hazard of flooding.

The capability subclass is IVw.

CaA—Calloway silt loam, 0 to 3 percent slopes. This very deep, somewhat poorly drained, nearly level soil is on broad upland ridges and stream terraces. Individual areas range from 5 to more than 50 acres in size.

Typically, the surface layer is dark brown, mottled silt loam about 8 inches thick. The subsoil extends to a depth of about 60 inches. From 8 to 19 inches, it is yellowish brown and pale brown, mottled silt loam. From 19 to 60 inches, it is a firm, compact, brittle fragipan that is light brownish gray and yellowish brown, mottled silty clay loam in the upper part and yellowish brown, mottled silt loam in the lower part.

This soil is low in content of organic matter. Permeability is moderate above the fragipan and slow in the fragipan. The available water capacity is moderate. Tilth is good, and the soil can be worked throughout a wide range in moisture content without excessive clodding and crusting. Depth to a perched seasonal high water table ranges from 12 to 24 inches. The root zone is moderately deep and is restricted by the fragipan.

Included with this soil in mapping are small areas of Loring soils on uplands and Routon and Center soils on stream terraces. Also included are small areas that are subject to flooding, areas of soils that are similar to the Calloway soil but have a fragipan that is less than 10 inches thick or are poorly drained, areas where slopes range from 3 to 5 percent, and slick spots, which are high in content of sodium. Included soils make up less than 15 percent of this map unit, and individual areas of the included soils generally are less than 3 acres in size.

Most areas are used for row crops, such as soybeans, milo, corn, and wheat. A few areas are wooded.

This soil is suited to the cultivated crops commonly grown in the survey area. Restricting tillage to periods of favorable moisture conditions helps to prevent clodding and crusting. Cultivation and harvesting are delayed in some years because of the wetness. Returning crop residue to the soil, establishing cover crops, and including grasses and legumes in the cropping sequence help to maintain desirable soil structure, improve tilth, and increase the content of organic matter.

This soil is suited to hay and pasture. A drainage system, control of weeds, proper stocking rates, rotation grazing, and applications of fertilizer and lime increase forage production. The pasture and hay species that can tolerate seasonal wetness should be selected for planting.

This soil is suited to woodland. The species that are preferred for planting include sweetgum, yellow-poplar, cherrybark oak, and loblolly pine. Table 7 provides specific information relating to potential productivity.

The main concerns in managing woodland are an equipment limitation and plant competition. The seasonal high water table restricts the use of equipment to periods when the soil is dry. Without intensive site preparation and maintenance, undesirable plants hinder natural or artificial reforestation.

This soil is well suited to habitat for openland and woodland wildlife.

This soil is poorly suited to most urban uses and sanitary facilities because of the wetness. It is poorly suited to septic tank absorption fields because of the wetness and the restricted permeability. Low strength is a limitation on sites for local roads and streets. Proper design and installation can help to overcome or minimize some of the limitations affecting these uses.

The capability subclass is IIw.

CbA—Calloway silt loam, 0 to 2 percent slopes, rarely flooded. This very deep, somewhat poorly drained, nearly level soil is on low stream terraces. Individual areas range from 5 to 100 acres in size.

Typically, the surface layer is dark brown, mottled silt loam about 8 inches thick. The subsoil extends to a depth of about 60 inches. From 8 to 19 inches, it is yellowish brown and pale brown, mottled silt loam. From 19 to 60 inches, it is a firm, compact, brittle fragipan that is light brownish gray and yellowish brown, mottled silty clay loam in the upper part and yellowish brown, mottled silt loam in the lower part.

This soil is low in the content of organic matter. Permeability is moderate above the fragipan and slow in the fragipan. The available water capacity is moderate. Tilth is good, and the soil can be worked throughout a wide range in moisture content without excessive clodding and crusting. Depth to a perched seasonal high water table ranges from 12 to 24 inches. The root zone is moderately deep and is restricted by the fragipan. The soil is subject to rare flooding in winter and spring.

Included with this soil in mapping are small areas of Routon and Center soils. These soils are in landscape positions similar to those of the Calloway soil. Also included are areas of Dekoven, Adler, and Convent soils on flood plains; areas that are frequently flooded; areas of soils that are similar to the Calloway soil but have a fragipan that is less than 10 inches thick or are poorly drained; areas where slopes range from 2 to 4 percent; and slick spots, which are high in content of

sodium. Included soils make up less than 20 percent of this map unit, and individual areas of the included soils generally are less than 3 acres in size.

Most areas are used for row crops, such as soybeans, milo, and corn. A few areas are wooded.

This soil is suited to the cultivated crops commonly grown in the survey area. It is less suitable for small grain because of the rare flooding in winter and spring. Restricting tillage to periods of favorable moisture conditions helps to prevent clodding and crusting. Cultivation and harvesting are delayed in some years because of the wetness. Returning crop residue to the soil, establishing cover crops, and including grasses and legumes in the cropping sequence help to maintain desirable soil structure, improve tilth, and increase the content of organic matter. In some years crops are damaged by flooding.

This soil is suited to pasture and hay, but the flooding and the wetness are management concerns. A drainage system, control of weeds, proper stocking rates, rotation grazing, and applications of fertilizer and lime increase forage production. The pasture and hay species that can tolerate seasonal wetness and flooding should be selected for planting.

This soil is suited to woodland. The species that are preferred for planting include sweetgum, yellow-poplar, cherrybark oak, and loblolly pine. Table 7 provides specific information relating to potential productivity.

The main concerns in managing woodland are an equipment limitation and plant competition. The seasonal high water table restricts the use of equipment to periods when the soil is dry. Without intensive site preparation and maintenance, undesirable plants hinder natural or artificial reforestation.

This soil is well suited to habitat for openland and woodland wildlife.

This soil is poorly suited to most urban uses and sanitary facilities because of the wetness and the hazard of flooding. It is poorly suited to septic tank absorption fields because of the wetness and the restricted permeability. Low strength is a limitation on sites for local roads and streets. Proper design and installation can help to overcome or minimize some of the limitations affecting these uses.

The capability subclass is IIw.

CeA—Center silt loam, 0 to 3 percent slopes, rarely flooded. This very deep, moderately well drained or somewhat poorly drained, nearly level soil is on low stream terraces throughout the survey area. Individual areas range from 5 to 40 acres in size.

Typically, the surface layer is dark brown silt loam about 6 inches thick. The subsoil extends to a depth of about 50 inches. It is yellowish brown, mottled silty clay loam in the upper part; light brownish gray, mottled silty clay loam in the next part; and yellowish brown, brown, and grayish brown silt loam in the lower part. The substratum, from a depth of 50 to 60 inches, is mixed yellowish brown, brown, and grayish brown silt loam.

This soil is moderate in content of organic matter. Permeability is moderately slow, and the available water capacity is high. Tilth is good, and the soil can be worked throughout a wide range in moisture content without excessive clodding and crusting. Depth to the seasonal high water table ranges from 12 to 30 inches. The root zone is very deep and can be easily penetrated by plant roots. The soil is subject to rare flooding of very brief duration in winter and spring.

Included with this soil in mapping are small areas of Calloway and Loring soils. These soils are in landscape positions similar to those of the Center soil. Also included are small areas of Adler, Convent, Dekoven, Mhoon, and Routon soils on flood plains; soils that are similar to Center soil but have a dominantly gray horizon between depths of 10 and 20 inches; areas where slopes range from 3 to 5 percent; clayey soils; and slick spots, which have a high content of sodium. Included soils make up less than 20 percent of this map unit, and individual areas of the included soils generally are less than 3 acres in size.

Most areas are used for row crops, such as soybeans, corn, milo, and wheat. Some areas are used for pasture or hay.

If drained, this soil is well suited to the cultivated crops commonly grown in the survey area. Open drainage ditches in combination with grassed waterways or tile drainage systems can remove excess water. Applying a system of conservation tillage, returning crop residue to the soil, establishing cover crops, and including grasses and legumes in the cropping sequence help to maintain desirable soil structure, improve tilth, increase the content of organic matter, and reduce the hazard of erosion.

This soil is suited to pasture and hay, but the flooding and the wetness are management concerns. A drainage system, control of weeds, proper stocking rates, rotation grazing, and applications of fertilizer and lime increase forage production. The pasture and hay species that can tolerate seasonal wetness and flooding should be selected for planting.

This soil is well suited to woodland. The species that are preferred for planting include eastern cottonwood, sweetgum, American sycamore, and cherrybark oak. Table 7 provides specific information relating to potential productivity.

The main concern in managing woodland is plant competition. Without intensive site preparation and

maintenance, undesirable plants hinder natural or artificial reforestation.

This soil is well suited to habitat for openland and woodland wildlife.

This soil is poorly suited to most urban uses and sanitary facilities because of the wetness and the hazard of flooding. It is poorly suited to septic tank absorption fields because of the wetness and the restricted permeability. Low strength is a limitation on sites for local roads and streets. Proper design and installation can help to overcome or minimize some of the limitations affecting these uses.

The capability subclass is IIw.

Cm—Commerce silt loam, frequently flooded. This very deep, somewhat poorly drained, nearly level soil is on flood plains along the Mississippi River. Individual areas range from 10 to more than 200 acres in size.

Typically, the surface layer is dark grayish brown silt loam about 5 inches thick. The subsoil extends to a depth of about 30 inches. It is dark grayish brown and dark gray, mottled silty clay loam and silt loam. The substratum, from a depth of 30 to 60 inches, is dark gray and dark grayish brown, mottled silty clay loam.

This soil is high in content of organic matter. Permeability is moderately slow, and the available water capacity is high. Tilth is good, and the soil can be worked throughout a wide range in moisture content without excessive clodding and crusting. Depth to the seasonal high water table ranges from 18 to 48 inches. The root zone is very deep. The shrink-swell potential is moderate in the subsoil. The soil is frequently flooded for brief or long periods in winter and spring.

Included with this soil in mapping are small areas of Openlake, Bardwell, and Robinsonville soils. These soils are in landscape positions similar to those of the Commerce soil. Also included are soils that are similar to the Commerce soil but have more sand; small areas of soils on narrow, steep riverbanks; and areas where slopes range from 2 to 4 percent. Included soils make up less than 15 percent of this map unit, and individual areas of the included soils generally are less than 3 acres in size.

Most areas are used for row crops, such as soybeans, corn, and milo. Some areas are wooded. This soil generally is not used for pasture or hay.

If drained, this soil is suited to corn and soybeans. It is not suited to small grain because of the hazard of flooding. Open drainage ditches in combination with grassed waterways or tile drainage systems can remove excess water. Returning crop residue to the soil helps to maintain desirable soil structure, improve tilth, and increase the content of organic matter. In some years crops are damaged by flooding. Cultivation and harvesting are delayed in some years because of the wetness.

This soil is well suited to woodland. Eastern cottonwood, green ash, and sweetgum are some of the native trees. The species that are preferred for planting include eastern cottonwood, sweetgum, green ash, and American sycamore. Table 7 provides specific information relating to potential productivity.

The main concerns in managing woodland are an equipment limitation, seedling mortality, and plant competition. The seasonal high water table restricts the use of equipment to periods when the soil is dry. Without intensive site preparation and maintenance, undesirable plants hinder natural or artificial reforestation. The seedling mortality rate may be high in areas that are subject to flooding.

This soil is well suited to habitat for woodland wildlife.

This soil is poorly suited to most urban uses and sanitary facilities because of the wetness and the hazard of flooding. It is poorly suited to septic tank absorption fields because of the hazard of flooding, the wetness, and the restricted permeability. Low strength is a limitation on sites for local roads and streets.

The capability subclass is IVw.

Cn—Convent-Adler silt loams, frequently flooded. These very deep, somewhat poorly drained and moderately well drained, nearly level soils are on flood plains. The two soils occur as areas so intricately mixed or so small that they could not be mapped separately at the selected scale. Individual areas range from 10 to more than 150 acres in size.

Convent silt loam makes up about 50 percent of this map unit, and Adler silt loam makes up about 35 percent. Other soils make up about 15 percent.

Typically, the surface layer of the Convent soil is dark brown, mottled silt loam about 10 inches thick. The subsurface layer extends to a depth of about 18 inches. It is dark brown, mottled silt loam. The subsoil, from a depth of 18 to 24 inches, is grayish brown, mottled silt loam. A buried subsoil extends from a depth of 24 to 60 inches. It is light brownish gray, mottled silt loam.

The Convent soil is moderate in content of organic matter. Permeability is moderate, and the available water capacity is high. Tilth is good, and the soil can be worked throughout a wide range in moisture content without excessive clodding and crusting. Depth to the seasonal high water table ranges from 18 to 48 inches. The root zone is very deep and can be easily penetrated by plant roots. The soil is frequently flooded for brief periods in winter and spring.

Typically, the surface layer of the Adler soil is about 11 inches thick. It is dark yellowish brown. It is silt loam in the upper part and mottled silt in the lower part. The

substratum, from a depth of 11 to 27 inches, is brown, mottled silt loam in the upper part and dark yellowish brown, mottled silt in the lower part. Below this is a buried surface layer, from a depth of 27 to 38 inches. This layer is silt loam. It is dark brown and mottled in the upper part and very dark grayish brown in the lower part. The buried subsoil, from a depth of 38 to 60 inches, is silt loam. It is dark brown and mottled in the upper part and grayish brown and dark grayish brown in the lower part.

The Adler soil is low or moderate in content of organic matter. Permeability is moderate, and the available water capacity is high. Tilth is good, and the soil can be worked throughout a wide range in moisture content without excessive clodding and crusting. Depth to the seasonal high water table ranges from 24 to 36 inches. The root zone is very deep and can be easily penetrated by plant roots. The soil is frequently flooded for brief periods in winter and spring.

Included with these soils in mapping are small areas of Mhoon soils. These included soils are in landscape positions similar to those of the Convent and Adler soils. Also included are small areas of Center and Routon soils on low stream terraces; soils that are similar to the Convent and Adler soils but are more acid or more clayey; and areas where slopes range from 2 to 4 percent. Included soils make up less than 15 percent of this map unit, and individual areas of the included soils generally are less than 3 acres in size.

Most areas are used for row crops, such as soybeans, corn, and milo. Some areas are wooded.

If drained, these soils are well suited to soybeans, milo, and corn. Cultivation and harvesting are delayed in some years because of the wetness. Open drainage ditches in combination with grassed waterways or tile drainage systems can remove excess water. In some years flooding damages crops or delays planting. Returning crop residue to the soils, establishing cover crops, and including grasses and legumes in the cropping sequence help to maintain desirable soil structure, improve tilth, and increase the content of organic matter.

These soils are suited to pasture and hay. A drainage system, control of weeds, proper stocking rates, rotation grazing, and applications of fertilizer and lime can increase forage production. The pasture and hay species that can tolerate seasonal wetness and flooding should be selected for planting.

These soils are well suited to woodland. Bottom-land oaks, green ash, and sweetgum are some of the native trees. The species that are preferred for planting include eastern cottonwood, American sycamore, green ash, and sweetgum on both soils and yellow-poplar and cherrybark oak on the Adler soil. Table 7 provides specific information relating to potential productivity.

The main concerns in managing woodland are an equipment limitation, seedling mortality, and plant competition. The seasonal high water table restricts the use of equipment to periods when the soils are dry. Without intensive site preparation and maintenance, undesirable plants hinder natural or artificial reforestation. The seedling mortality rate may be high in areas that are subject to flooding.

These soils are well suited to habitat for woodland wildlife.

These soils are poorly suited to most urban uses and sanitary facilities because of the wetness and the hazard of flooding.

The capability subclass is IIw.

Ct—Convent-Mhoon silt loams, frequently flooded. These very deep, somewhat poorly drained and poorly drained, nearly level soils are on flood plains. The two soils occur as areas so closely intermingled that they could not be mapped separately at the selected scale. Individual areas range from 10 to more than 150 acres in size.

Convent silt loam makes up about 40 percent of this map unit, and Mhoon silt loam makes up about 40 percent. Other soils make up about 20 percent.

Typically, the surface layer of the Convent soil is dark brown, mottled silt loam about 10 inches thick. The subsurface layer extends to a depth of about 18 inches. It is dark brown, mottled silt loam. The subsoil, from a depth of 18 to 24 inches, is grayish brown, mottled silt loam. A buried subsoil extends from a depth of 24 to 60 inches. It is light brownish gray, mottled silt loam.

The Convent soil is moderate in content of organic matter. Permeability is moderate, and the available water capacity is high. Tilth is good, and the soil can be worked throughout a wide range in moisture content without excessive clodding and crusting. Depth to the seasonal high water table ranges from 18 to 48 inches. The root zone is very deep and can be easily penetrated by plant roots. The soil is frequently flooded for brief or long periods in winter and spring.

Typically, the surface layer of the Mhoon soil is dark grayish brown silt loam about 10 inches thick. The subsoil extends to a depth of about 40 inches. It is gray, mottled silt loam. The substratum, from a depth of 40 to 60 inches, also is gray, mottled silt loam.

The Mhoon soil is moderate in content of organic matter. Permeability is slow, and the available water capacity is high. Tilth is good, but the seasonal high water table delays cultivation. The seasonal high water table is within a depth of 36 inches. The root zone is very deep and can be easily penetrated by plant roots. The shrink-swell potential is moderate in the subsoil.

The soil is frequently flooded for brief or long periods in winter and spring.

Included with these soils in mapping are small areas of Adler and Dekoven soils. These included soils are in landscape positions similar to those of the Convent and Mhoon soils. Also included are small areas of Routon and Calloway soils on stream terraces, areas that are subject to ponding, soils that are acid, soils that have a high content of sodium, poorly drained soils that have less clay than the Mhoon soil, and areas where slopes range from 2 to 4 percent. Included soils make up less than 20 percent of this map unit, and individual areas of the included soils generally are less than 3 acres in size.

Most areas are wooded. Some areas are used for corn or soybeans, and some are idle.

These soils are suited to the cultivated crops commonly grown in the survey area. They are not suited to small grain because of the hazard of flooding. Cultivation and harvesting are delayed in some years because of the wetness. Open drainage ditches in combination with grassed waterways or tile drainage systems can remove excess water. In some years flooding damages crops or delays planting. Returning crop residue to the soils, establishing cover crops, and including grasses and legumes in the cropping sequence help to maintain desirable soil structure, improve tilth, and increase the content of organic matter.

These soils are suited to pasture and hay, but the flooding and the wetness are management concerns. A drainage system, control of weeds, proper stocking rates, rotation grazing, and applications of fertilizer and lime can increase forage production. The pasture and hay species that can tolerate seasonal wetness and flooding should be selected for planting.

These soils are well suited to woodland. Bottom-land oaks, green ash, eastern cottonwood, and sweetgum are some of the native trees. The species that are preferred for planting include eastern cottonwood, green ash, sweetgum, and American sycamore. Table 7 provides specific information relating to potential productivity.

The main concerns in managing woodland are an equipment limitation, seedling mortality, and plant competition. The seasonal high water table restricts the use of equipment to periods when the soils are dry. Without intensive site preparation and maintenance, undesirable plants hinder natural or artificial reforestation. The seedling mortality rate may be high in areas that are subject to flooding.

The Convent soil is well suited to habitat for woodland wildlife, and the Mhoon soil is well suited to habitat for wetland wildlife.

These soils are poorly suited to most urban uses and sanitary facilities because of the hazard of flooding and the wetness. They are poorly suited to septic tank absorption fields because of the wetness and hazard of flooding in areas of both soils and the restricted permeability in the Mhoon soil. Low strength is a limitation on sites for local roads and streets in areas of the Mhoon soil.

The capability subclass is IIIw.

Cv—Crevasse sand, frequently flooded. This very deep, excessively drained, nearly level soil is on flood plains along the Mississippi River. Because of the frequent flooding, some areas have irregular slopes that resemble miniature dunes. Individual areas range from 10 to more than 150 acres in size.

Typically, the surface layer is brown and grayish brown sand about 13 inches thick. The underlying material extends to a depth of about 60 inches. It is grayish brown and yellowish brown sand and fine sand.

This soil is low in content of organic matter. Permeability is rapid, and the available water capacity is low. Tilth is poor because of a high content of sand. Depth to the seasonal high water table ranges from 3.5 to 6.0 feet. The root zone is very deep and can be easily penetrated by plant roots. The soil is frequently flooded for brief or long periods in winter and spring.

Included with this soil in mapping are small areas of Commerce, Robinsonville, and Bardwell soils. These soils are in landscape positions similar to those of the Crevasse soil. Also included are soils on steep riverbanks, idle sandbars that are frequently flooded during the growing season, areas where slopes range from 2 to 5 percent, and soils that have less sand and clay than the Crevasse soil. Included soils make up less than 20 percent of this map unit, and individual areas of the included soils generally are less than 3 acres in size.

Most areas are used as woodland. A few areas are used for cultivated crops, such as soybeans. This map unit generally is not used for pasture or hay.

This soil is poorly suited to cultivated crops because of the sandy surface layer, which limits the use of farm equipment. The soil is not suited to small grain because of the hazard of flooding.

This soil is suited to woodland. The species that are preferred for planting include eastern cottonwood, sweetgum, green ash, and loblolly pine. Table 7 provides specific information relating to potential productivity.

The main concerns in managing woodland are an equipment limitation and seedling mortality. The sandy surface layer hinders the use of wheeled equipment, especially when the soil is saturated or very dry. The

seedling mortality rate may be high in areas that are subject to flooding.

This soil is poorly suited to most urban uses and sanitary facilities because of the hazard of flooding. It is poorly suited to septic tank absorption fields because of the hazard of flooding, the wetness, and a poor filtering capacity.

The capability subclass is IVs.

De—Dekoven silt loam, overwash, occasionally flooded. This very deep, very poorly drained, nearly level soil is on flood plains. Individual areas range from 5 to 50 acres in size.

Typically, the surface layer is dark brown, mottled silt loam about 14 inches thick. A buried subsoil extends to a depth of about 60 inches. It is very dark gray, mottled silt loam in the upper 12 inches and dark gray, mottled silty clay loam in the lower part.

This soil is high in content of organic matter. Permeability is moderate, and the available water capacity is high. Tilth is good, and the soil can be worked throughout a wide range in moisture content without excessive clodding and crusting. Depth to the seasonal high water table ranges from 12 to 18 inches. The root zone is very deep and can be easily penetrated by plant roots. The soil is occasionally flooded for brief periods in winter and spring.

Included with this soil in mapping are small areas of Adler, Convent, and Mhoon soils. These soils are in landscape positions similar to those of the Dekoven soil. Also included are small areas of Calloway, Routon, and Center soils on low stream terraces; clayey soils; slick spots, which have a high content of sodium; and areas where slopes range from 2 to 4 percent. Included soils make up less than 15 percent of this map unit, and individual areas of the included soils generally are less than 3 acres in size.

Most areas are used for row crops, such as soybeans and corn. Some areas are used for pasture or hay.

If drained, this soil is suited to corn and soybeans. It is not suited to small grain because of the hazard of flooding. Cultivation and harvesting are delayed in some years because of the wetness. Returning crop residue to the soil, establishing cover crops, and including grasses and legumes in the cropping sequence help to maintain desirable soil structure, improve tilth, and increase the content of organic matter.

This soil is suited to pasture and hay, but the flooding and the wetness are management concerns. A drainage system, control of weeds, proper stocking rates, rotation grazing, and applications of fertilizer and lime increase forage production. The pasture and hay species that can tolerate seasonal wetness and flooding should be selected for planting.

This soil is well suited to woodland. Bottom-land oaks, green ash, and sweetgum are some of the native trees. The species that are preferred for planting are pin oak, sweetgum, and American sycamore. Table 7 provides specific information relating to potential productivity.

The main concerns in managing woodland are an equipment limitation, seedling mortality, and plant competition. The seasonal high water table restricts the use of equipment to periods when the soil is dry. The seedling mortality rate may be high in areas that are subject to flooding. Without intensive site preparation and maintenance, undesirable plants hinder natural or artificial reforestation.

This soil is well suited to habitat for wetland wildlife.

This soil is poorly suited to most urban uses and sanitary facilities, including septic tank absorption fields, because of the hazard of flooding and the wetness. Low strength is a limitation on sites for local roads and streets.

The capability subclass is IIIw.

Iu—Iuka sandy loam, occasionally flooded. This very deep, moderately well drained, nearly level soil is on flood plains. Individual areas range from 5 to 100 acres in size.

Typically, the surface layer is very dark grayish brown sandy loam about 4 inches thick. The underlying material extends to a depth of about 60 inches. It is brownish yellow and yellowish brown loamy sand in the upper part, brownish yellow gravelly loamy sand in the next part, and brown, mottled silt loam in the lower part.

This soil is low in content of organic matter. Permeability and the available water capacity are moderate. Tilth is good, and the soil can be worked throughout a wide range in moisture content without excessive clodding and crusting. Depth to the seasonal high water table ranges from 12 to 36 inches. The root zone is very deep and can be easily penetrated by plant roots. The soil is occasionally flooded for brief periods in winter and spring.

Included with this soil in mapping are small areas of Adler, Convent, and Mhoon soils. These soils are in landscape positions similar to those of the Iuka soil. Also included are areas where slopes range from 2 to 6 percent, small areas of Iuka soils that have a gravelly surface layer, and small areas that are frequently flooded. Included soils make up less than 25 percent of this map unit, and individual areas of the included soils generally are less than 3 acres in size.

Most areas are used as woodland or pasture. Some areas are used for corn or soybeans.

This soil is suited to the cultivated crops commonly grown in the survey area. Returning crop residue to the soil, establishing cover crops, and including grasses and legumes in the cropping sequence help to maintain desirable soil structure, improve tilth, and increase the content of organic matter.

This soil is suited to hay and pasture. Applying fertilizer, controlling weeds, brush, and grazing, and properly establishing the plants increase forage production. Some hay crops may be damaged by flooding.

This soil is well suited to woodland. Bottom-land oaks, eastern cottonwood, and sweetgum are some of the native trees. The species that are preferred for planting include loblolly pine, eastern cottonwood, and yellow-poplar. Table 7 provides specific information relating to potential productivity.

The main concerns in managing woodland are an equipment limitation, seedling mortality, and plant competition. The seasonal high water table restricts the use of equipment to periods when the soil is dry. Without intensive site preparation and maintenance, undesirable plants hinder natural or artificial reforestation. The seedling mortality rate may be high in areas that are subject to flooding.

This soil is well suited to habitat for openland and woodland wildlife.

This soil is poorly suited to most urban uses and sanitary facilities, including septic tank absorption fields, because of the hazard of flooding and the wetness.

The capability subclass is IIw.

Kb—Keyespoint and Bardwell soils, frequently flooded. These very deep, somewhat poorly drained and well drained, nearly level soils are on flood plains along the Mississippi River. The two soils are associated on the landscape but do not occur in a regular pattern. Every area has at least one of the two soils, and many areas have both of them. Individual areas range from 10 to more than 150 acres in size.

Keyespoint silty clay loam makes up about 45 percent of this map unit, and Bardwell silt loam makes up about 30 percent. Other soils make up about 25 percent.

Typically, the surface layer of the Keyespoint soil is very dark grayish brown, mottled silty clay loam about 6 inches thick. The subsoil extends to a depth of about 28 inches. It is dark grayish brown, mottled silty clay and silty clay loam. The substratum extends to a depth of about 60 inches. It is brown, mottled loamy sand in the upper part and grayish brown, mottled very fine sandy loam in the lower part.

The Keyespoint soil is moderate in content of organic matter. Permeability is very slow in the upper clayey layers and moderately rapid in the lower loamy layers. The available water capacity is high. Tilth is poor, and the soil clods and crusts unless it is tilled within the proper moisture conditions. The shrink-swell potential is high in the subsoil. Depth to the seasonal high water table ranges from 24 to 42 inches. The root zone is very deep and can be easily penetrated by plant roots. The soil is frequently flooded for brief or long periods in winter and spring.

Typically, the surface layer of the Bardwell soil is about 17 inches thick. It is dark brown. It is silt loam in the upper part and silty clay loam in the lower part. The subsoil extends to a depth of about 60 inches. It is brown silty clay loam in the upper part and yellowish brown, mottled silt loam in the lower part.

The Bardwell soil is high in content of organic matter. Permeability is moderate, and the available water capacity is high. Tilth is good, and the soil can be worked throughout a wide range in moisture content without excessive clodding and crusting. Depth to the seasonal high water table ranges from 3 to 6 feet. The root zone is very deep and can be easily penetrated by plant roots. The soil is frequently flooded for brief or long periods in winter and spring.

Included with these soils in mapping are small areas of Bowdre, Openlake, Commerce, Mhoon, and Robinsonville soils. These included soils are in landscape positions similar to those of the Keyespoint and Bardwell soils. Also included are areas of soils on narrow, steep riverbanks and areas where slopes range from 2 to 4 percent. Included soils make up less than 25 percent of this map unit, and individual areas of the included soils generally are less than 3 acres in size.

Most areas are used for row crops, such as soybeans, corn, and milo. Some areas are wooded. This map unit generally is not used for pasture or hay.

If protected from flooding, these soils are well suited to most of the cultivated crops commonly grown in the survey area. They are not suited to small grain because of the hazard of flooding. Restricting tillage to periods of favorable moisture conditions helps to prevent clodding and crusting. Returning crop residue to the soils, establishing cover crops, and including grasses and legumes in the cropping sequence help to maintain desirable soil structure, improve tilth, and increase the content of organic matter. In some years crops are damaged by flooding.

These soils are well suited to woodland. Eastern cottonwood, green ash, and sweetgum are some of the native trees. The species that are preferred for planting include sweetgum, cherrybark oak, green ash, and pecan. Table 7 provides specific information relating to potential productivity.

The main concerns in managing woodland are an equipment limitation and seedling mortality on the Keyespoint soil and plant competition on both soils. The seasonal high water table restricts the use of equipment to periods when the soils are dry. Without intensive site preparation and maintenance, undesirable plants hinder natural or artificial reforestation. The seedling mortality rate may be high in areas that are subject to flooding.

These soils are well suited to habitat for woodland wildlife.

Because of the hazard of flooding on both soils and the wetness and high shrink-swell potential of the Keyespoint soil, these soils are poorly suited to most urban uses and sanitary facilities. They are poorly suited to septic tank absorption fields because of the hazard of flooding and wetness in areas of both soils and the restricted permeability in the Keyespoint soil. Low strength and the shrink-swell potential are limitations on sites for local roads and streets in areas of the Keyespoint soil.

The capability subclass is IIIw.

LoB—Loring silt loam, 2 to 6 percent slopes. This very deep, moderately well drained, gently sloping soil is on broad and narrow ridges in the uplands throughout the survey area. Slopes are convex or slightly concave. Individual areas range from 5 to 150 acres in size.

Typically, the surface layer is dark brown silt loam about 8 inches thick. The subsoil extends to a depth of about 60 inches. From 8 to 22 inches, it is yellowish brown silt loam. From 22 to 27 inches, it is yellowish brown, mottled silt loam. From 27 to 60 inches, it is a firm, compact, brittle fragipan of strong brown and dark brown, mottled silt loam.

This soil is low in content of organic matter. Permeability is moderate above the fragipan and moderately slow in the fragipan. The available water capacity is moderate. Tilth is good, and the soil can be worked throughout a wide range in moisture content without excessive clodding and crusting. Depth to a perched seasonal high water table ranges from 24 to 36 inches. The root zone is moderately deep and is restricted by the fragipan.

Included with this soil in mapping are small areas of Calloway and Memphis soils on uplands and Calloway, Center, and Routon soils on low stream terraces. Also included are small areas of Loring soils that have slopes of more than 6 percent and areas that are severely eroded. Included soils make up less than 10 percent of this map unit, and individual areas of the included soils generally are less than 3 acres in size.

Most areas are used for row crops, such as soybeans, corn, milo, and wheat. Some areas are used for pasture or hay.

This soil is well suited to the cultivated crops commonly grown in the survey area, such as corn, milo, soybeans, and small grain. The best suited cultivated crops are those that have shallow or moderately deep rooting systems and can tolerate slight wetness. The root zone is restricted by the very firm, dense fragipan at a depth of 18 to 30 inches. Crop production is limited during dry periods. If the soil is cultivated, the hazard of erosion is moderate. Measures that slow surface runoff, help to control erosion, and ensure continued high crop yields are needed. Examples are conservation tillage, contour farming, stripcropping, cover crops, a cropping sequence that includes grasses and legumes, and applications of lime and fertilizer according to the needs of the crop. Leaving crop residue on or near the surface and incorporating it into the plow layer can help to maintain good tilth and increase the content of organic matter.

If properly managed, this soil is well suited to most pasture and hay plants. The fragipan, however, restricts the rooting depth and limits forage production during dry periods. The forage species that have moderately deep rooting systems and can tolerate slight wetness grow best. The species that produce adequate forage and provide a satisfactory ground cover should be selected for planting. The desired species can be maintained by frequent pasture renovation. Applications of lime and fertilizer, proper stocking rates, rotation grazing, and control of undesirable vegetation are some of the management needs.

This soil is well suited to woodland. The native trees are upland oaks, hickory, and yellow-poplar. The species that are preferred for planting include white oak, loblolly pine, yellow-poplar, and eastern white pine. Table 7 provides specific information relating to potential productivity.

The main concern in managing woodland is plant competition. Without intensive site preparation and maintenance, undesirable plants hinder natural or artificial reforestation.

This soil is well suited to habitat for openland and woodland wildlife.

This soil is suited to most urban uses and sanitary facilities. The wetness is the main limitation. The soil is poorly suited to septic tank absorption fields because of the wetness and the restricted permeability. Low strength is a limitation on sites for local roads and streets. Proper design and installation can help to overcome or minimize some of the limitations affecting these uses.

The capability subclass is IIe.

LoB3—Loring silt loam, 2 to 6 percent slopes, severely eroded. This very deep, moderately well drained, gently sloping soil is on convex or concave side slopes and narrow ridges in the uplands throughout the survey area. Erosion has removed most of the original surface layer and some of the subsoil. Individual areas range from 5 to 75 acres in size.

Typically, the surface layer is dark yellowish brown silt loam about 7 inches thick. The subsoil extends to a depth of about 60 inches. From 7 to 14 inches, it is yellowish brown, mottled silt loam. From 14 to 60 inches, it is a firm, compact, brittle fragipan of yellowish brown and dark yellowish brown silt loam.

This soil is low in content of organic matter. Permeability is moderate above the fragipan and moderately slow in the fragipan. The available water capacity is low. Tilth is good, and the soil can be worked throughout a wide range in moisture content without excessive clodding and crusting. Depth to a perched seasonal high water table ranges from 14 to 24 inches. The fragipan is at a depth of 14 to 24 inches. After periods of rainfall, it restricts the downward movement of water (percolation) and, in combination with the slope, enhances lateral water movement (subsurface flow). The root zone is shallow because of the depth to a fragipan.

Included with this soil in mapping are small areas of Calloway and Memphis soils on uplands and Calloway, Center, and Routon soils on low stream terraces. Also included are some areas of soils that are more acid in the upper part of the subsoil than the Loring soil, small areas of Loring soils that have slopes of more than 6 percent, and areas of Loring soils that are not severely eroded. Included soils make up less than 15 percent of this map unit, and individual areas of the included soils generally are less than 3 acres in size.

Most areas are used for row crops, such as soybeans, corn, milo, and wheat. Some areas are used for pasture or hay.

This soil is suited to the cultivated crops commonly grown in the survey area. The best suited cultivated crops are those that have shallow or moderately deep rooting systems. The root zone is restricted by the very firm, dense fragipan at a depth of 14 to 24 inches. Crop production is limited during dry periods. If the soil is cultivated, the hazard of erosion is severe. Measures that slow surface runoff, help to control erosion, and ensure continued high crop yields are needed. Examples are conservation tillage, contour farming, stripcropping, cover crops, a cropping sequence that includes grasses and legumes, and applications of lime and fertilizer according to the needs of the crop. Leaving crop residue on or near the surface and incorporating it into the plow layer can help to maintain good tilth and increase the content of organic matter.

This soil is suited to pasture and hay. The fragipan, however, restricts the rooting depth and limits forage production during dry periods. The forage species that have moderately deep rooting systems grow best. Planting the species that produce adequate forage and provide a satisfactory ground cover helps to control erosion. The desired species can be maintained by frequent pasture renovation. Applications of lime and fertilizer, proper stocking rates, rotation grazing, and control of undesirable vegetation are some of the management needs.

This soil is well suited to woodland. The native trees are upland oaks, hickory, and yellow-poplar. The species that are preferred for planting include loblolly pine, yellow-poplar, white oak, and eastern white pine. Table 7 provides specific information relating to potential productivity.

The main concern in managing woodland is plant competition. Without intensive site preparation and maintenance, undesirable plants hinder natural or artificial reforestation.

This soil is well suited to habitat for openland and woodland wildlife.

This soil is suited to most urban uses and sanitary facilities. It is poorly suited to septic tank absorption fields because of the restricted permeability. Low strength is a limitation on sites for local roads and streets. Proper design and installation can help to overcome or minimize some of the limitations affecting these uses.

The capability subclass is IIIe.

LoC2—Loring silt loam, 6 to 12 percent slopes, eroded. This very deep, moderately well drained, sloping soil is on slightly convex or concave side slopes and narrow ridges in the uplands throughout the survey area. About 25 to 75 percent of the original surface layer has been removed by erosion. Individual areas range from 5 to 20 acres in size.

Typically, the surface layer is brown silt loam about 8 inches thick. The subsoil extends to a depth of about 60 inches. From 8 to 22 inches, it is yellowish brown silt loam. From 22 to 27 inches, it is yellowish brown, mottled silt loam. From 27 to 60 inches, it is a firm, compact, brittle fragipan of strong brown and dark brown, mottled silt loam.

This soil is low in content of organic matter. Permeability is moderate above the fragipan and moderately slow in the fragipan. The available water capacity is moderate. Tilth is good, and the soil can be worked throughout a wide range in moisture content without excessive clodding and crusting. Depth to a perched seasonal high water table ranges from 24 to 36

inches. The root zone is moderately deep and is restricted by the fragipan.

Included with this soil in mapping are small areas of Loring soils that have slopes of more than 12 percent or less than 6 percent. Also included are severely eroded areas and small areas of Memphis soils. Included soils make up less than 15 percent of this map unit, and individual areas of the included soils generally are less than 3 acres in size.

Most areas are used for row crops, such as soybeans, milo, corn, and wheat. Some areas are used for pasture or hay, and some are idle.

This soil is suited to the cultivated crops commonly grown in the survey area. The best suited cultivated crops are those that have shallow or moderately deep rooting systems and can tolerate slight wetness. The root zone is restricted by the very firm, dense fragipan at a depth of 18 to 30 inches. Crop production is limited during dry periods. If the soil is cultivated, the hazard of erosion is severe. Measures that slow surface runoff, help to control erosion, and ensure continued high crop yields are needed. Examples are conservation tillage, contour farming, stripcropping, cover crops, a cropping sequence that includes grasses and legumes, and applications of lime and fertilizer according to the needs of the crop. Leaving crop residue on or near the surface and incorporating it into the plow layer can help to maintain good tilth and increase the content of organic matter.

If properly managed, this soil is well suited to most pasture and hay plants. The fragipan, however, restricts the rooting depth and limits forage production during dry periods. The forage species that have moderately deep rooting systems and can tolerate slight wetness grow best. The species that produce adequate forage and provide a satisfactory ground cover should be selected for planting. The desired species can be maintained by frequent pasture renovation. Applications of lime and fertilizer, proper stocking rates, rotation grazing, and control of undesirable vegetation are some of the management needs.

This soil is well suited to woodland. The native trees are upland oaks, hickory, and yellow-poplar. The species that are preferred for planting include loblolly pine, white oak, eastern white pine, and yellow-poplar. Table 7 provides specific information relating to potential productivity.

The main concern in managing woodland is plant competition. Without intensive site preparation and maintenance, undesirable plants hinder natural or artificial reforestation.

This soil is well suited to habitat for openland and woodland wildlife.

This soil is poorly suited to most urban uses and sanitary facilities. The wetness and the slope are the main limitations. The soil is poorly suited to septic tank absorption fields because of the wetness and the restricted permeability. Low strength is a limitation on sites for local roads and streets. Proper design and installation can help to overcome or minimize some of the limitations affecting these uses.

The capability subclass is IIIe.

LoC3—Loring silt loam, 6 to 12 percent slopes, severely eroded. This very deep, moderately well drained, sloping soil is on slightly convex or concave side slopes and narrow ridges in the uplands throughout the survey area. Erosion has removed most of the original surface layer and some of the subsoil. Some areas have rills and shallow gullies. Individual areas range from 3 to 75 acres in size.

Typically, the surface layer is dark yellowish brown silt loam about 7 inches thick. The subsoil extends to a depth of about 60 inches. From 7 to 14 inches, it is yellowish brown, mottled silt loam. From 14 to 60 inches, it is a firm, compact, brittle fragipan of yellowish brown and dark yellowish brown silt loam.

This soil is low in content of organic matter. Permeability is moderate above the fragipan and moderately slow in the fragipan. The available water capacity is low. Tilth is good, and the soil can be worked throughout a wide range in moisture content without excessive clodding and crusting. Depth to a perched seasonal high water table ranges from 14 to 24 inches. The fragipan is at a depth of 14 to 24 inches. After periods of rainfall, it restricts the downward movement of water (percolation) and, in combination with the slope, enhances lateral water movement (subsurface flow). The root zone is shallow because of the depth to a fragipan.

Included with this soil in mapping are small areas of Loring soils that have slopes of more than 12 percent or less than 6 percent and small areas that are not severely eroded. Also included are some areas of soils that are more acid in the upper part of the subsoil than the Loring soil, small areas of Memphis soils in landscape positions similar to those of the Loring soil, and small areas of Adler and Convent soils on narrow flood plains. Included soils make up less than 15 percent of this map unit, and individual areas of the included soils generally are less than 3 acres in size.

Most areas are used for pasture or hay. Some areas are used as woodland, and some are used for row crops, such as corn, soybeans, and wheat.

This soil is suited to the cultivated crops commonly grown in the survey area. The best suited cultivated crops are those that have shallow or moderately deep rooting systems. The root zone is restricted by the very

firm, dense fragipan at a depth of 14 to 24 inches. Crop production is limited during dry periods. If the soil is cultivated, the hazard of erosion is moderate. Measures that slow surface runoff, help to control erosion, and ensure continued high crop yields are needed. Examples are conservation tillage, contour farming, stripcropping, cover crops, a cropping sequence that includes grasses and legumes, and applications of lime and fertilizer according to the needs of the crop. Leaving crop residue on or near the surface and incorporating it into the plow layer can help to maintain good tilth and increase the content of organic matter.

This soil is suited to pasture and hay. The fragipan, however, restricts the rooting depth and limits forage production during dry periods. The forage species that have moderately deep rooting systems grow best. Planting the species that produce adequate forage and provide a satisfactory ground cover helps to control erosion. The desired species can be maintained by frequent pasture renovation. Applications of lime and fertilizer, proper stocking rates, rotation grazing, and control of undesirable vegetation are some of the management needs.

This soil is well suited to woodland. The native trees are upland oaks, hickory, and yellow-poplar. The species that are preferred for planting include loblolly pine, yellow-poplar, white oak, and eastern white pine. Table 7 provides specific information relating to potential productivity.

The main concern in managing woodland is plant competition. Without intensive site preparation and maintenance, undesirable plants hinder natural or artificial reforestation.

This soil is well suited to habitat for openland and woodland wildlife.

This soil is poorly suited to most urban uses and sanitary facilities. The slope is the main limitation. The soil is poorly suited to septic tank absorption fields because of the restricted permeability. Low strength is a limitation on sites for local roads and streets. Proper design and installation can help to overcome or minimize some of the limitations affecting these uses.

The capability subclass is IVe.

LoD3—Loring silt loam, 12 to 20 percent slopes, severely eroded. This very deep, moderately well drained, moderately steep soil is on side slopes in the uplands throughout the survey area. Erosion has removed most of the original surface layer and some of the subsoil. Some areas have moderately deep or deep gullies. Individual areas range from 10 to more than 100 acres in size.

Typically, the surface layer is dark yellowish brown silt loam about 7 inches thick. The subsoil extends to a depth of about 60 inches. From 7 to 14 inches, it is yellowish brown, mottled silt loam. From 14 to 60 inches, it is a firm, compact, brittle fragipan of yellowish brown and dark yellowish brown silt loam.

This soil is low in content of organic matter. Permeability is moderate above the fragipan and moderately slow in the fragipan. The available water capacity is low. Tilth is good, and the soil can be worked throughout a wide range in moisture content without excessive clodding and crusting. Depth to a perched seasonal high water table ranges from 14 to 24 inches. The fragipan is at a depth of 14 to 24 inches. After periods of rainfall, it restricts the downward movement of water (percolation) and, in combination with the slope, enhances lateral water movement (subsurface flow). The root zone is shallow because of the depth to a fragipan.

Included with this soil in mapping are small areas of Memphis and Saffell soils. These soils are in landscape positions similar to those of the Loring soil. Also included are small areas of Adler and Convent soils on narrow flood plains; soils that are more acid in the upper part of the subsoil than the Loring soil; soils that are similar to the Loring soil but have gravelly, sandy, and loamy coastal plain material below the fragipan and within a depth of 40 inches; and Loring and Memphis soils that have slopes of less than 12 percent or more than 20 percent. Included soils make up less than 20 percent of this map unit, and individual areas of the included soils generally are less than 3 acres in size.

Most areas are used for pasture or hay (fig. 10). Some areas are idle, and some are wooded. This soil is poorly suited to cultivated crops.

This soil is suited to pasture and hay. The fragipan, however, restricts the rooting depth and limits forage production during dry periods. The forage species that have moderately deep rooting systems grow best. Planting the species that produce adequate forage and provide a satisfactory ground cover helps to control erosion. The desired species can be maintained by frequent pasture renovation. Applications of lime and fertilizer, proper stocking rates, rotation grazing, and control of undesirable vegetation are some of the management needs.

This soil is suited to woodland. The native trees are upland oaks, hickory, and yellow-poplar. The species that are preferred for planting include loblolly pine, yellow-poplar, white oak, and eastern white pine. Table 7 provides specific information relating to potential productivity.

The main concerns in managing woodland are the hazard of erosion, an equipment limitation, and plant competition. Steep skid trails and firebreaks are subject to rilling and gullying unless they are protected by

Figure 10.—A pastured area of Loring silt loam, 12 to 20 percent slopes, severely eroded.

adequate water bars, a plant cover, or both. The slope restricts the use of wheeled and tracked equipment on skid trails. Cable yarding generally is safer than operating this equipment and results in less surface disturbance. Without intensive site preparation and maintenance, undesirable plants hinder natural or artificial reforestation.

This soil is well suited to habitat for woodland wildlife.

This soil is poorly suited to most urban uses and sanitary facilities. The slope is the main limitation. The soil is poorly suited to septic tank absorption fields because of the slope and the restricted permeability. Low strength is a limitation on sites for local roads and streets. Proper design and installation can help to overcome or minimize some of the limitations affecting these uses.

The capability subclass is VIe.

LsE3—Loring-Memphis-Saffell complex, 12 to 30 percent slopes, severely eroded. These very deep soils are on side slopes in the uplands. The Loring soil is moderately well drained and moderately steep, and the Memphis and Saffell soils are well drained and are moderately steep and steep. The three soils occur as areas so intricately mixed or so small that they could not be mapped separately at the selected scale. Erosion has removed most of the original surface layer and, in places, some of the subsoil. Some areas have moderately deep or deep gullies. Individual areas range from 10 to more than 100 acres in size.

Loring silt loam makes up about 35 percent of this map unit, Memphis silt loam makes up about 25 percent, and Saffell very gravelly loam makes up about 15 percent. Other soils make up about 25 percent.

Typically, the surface layer of the Loring soil is dark

yellowish brown silt loam about 7 inches thick. The subsoil extends to a depth of about 60 inches. From 7 to 14 inches, it is yellowish brown, mottled silt loam. From 14 to 60 inches, it is a firm, compact, brittle fragipan of yellowish brown and dark yellowish brown silt loam.

The Loring soil is low in content of organic matter. Permeability is moderate above the fragipan and moderately slow in the fragipan. The available water capacity is low. Tilth is good, and the soil can be worked throughout a wide range in moisture content without excessive clodding and crusting. The seasonal high water table is at a depth of more than 6 feet. The fragipan is at a depth of 14 to 24 inches. After periods of rainfall, it restricts the downward movement of water (percolation) and, in combination with the slope, enhances lateral water movement (subsurface flow). The root zone is shallow because of the depth to a fragipan.

Typically, the surface layer of the Memphis soil is dark yellowish brown silt loam about 6 inches thick. The subsoil extends to a depth of about 60 inches. It is brown silty clay loam in the upper 23 inches and strong brown silt loam in the lower 31 inches.

The Memphis soil is low in content of organic matter. Permeability is moderate, and the available water capacity is high. The root zone is very deep and can be easily penetrated by plant roots.

Typically, the surface layer of the Saffell soil is dark grayish brown very gravelly loam about 4 inches thick. The subsoil extends to a depth of about 48 inches. From 4 to 11 inches, it is yellowish brown very gravelly silt loam. From 11 to 31 inches, it is strong brown very gravelly sandy loam. From 31 to 48 inches, it is strong brown very gravelly clay loam. The substratum extends to a depth of about 60 inches. It is strong brown gravelly sandy loam.

The Saffell soil is low in content of organic matter. Permeability is moderate or moderately rapid, and the available water capacity is moderate. The root zone is very deep but is restricted because of the very gravelly layers.

Included with these soils in mapping are small areas of Adler and Convent soils on narrow flood plains. Also included are loamy soils that have a fragipan over loamy coastal plain sediments; loamy soils that have concretions of calcium carbonate; and soils that are similar to the Saffell soil but have less than 35 percent gravel. Included soils make up less than 25 percent of this map unit, and individual areas of the included soils generally are less than 3 acres in size.

Most areas are wooded or support scrub brush. A few areas are used as permanent pasture.

These soils are poorly suited to cultivated crops. The slope and a very severe hazard of erosion are the main management concerns.

These soils are suited to pasture. Planting the species that produce adequate forage and provide a satisfactory ground cover helps to control erosion. The desired species can be maintained by frequent pasture renovation. Applications of lime and fertilizer, proper stocking rates, rotation grazing, and control of undesirable vegetation are some of the management needs.

These soils are suited to woodland. The native trees are upland oaks, hickory, and yellow-poplar. The species that are preferred for planting include white oak, yellow-poplar, loblolly pine, and shortleaf pine. Table 7 provides specific information relating to potential productivity.

The main concerns in managing woodland are the hazard of erosion, an equipment limitation, seedling mortality, and plant competition. Steep skid trails and firebreaks are subject to rilling and gullying unless they are protected by adequate water bars, a plant cover, or both. The slope restricts the use of wheeled and tracked equipment on skid trails. Cable yarding generally is safer than operating this equipment and results in less surface disturbance. Without intensive site preparation and maintenance, undesirable plants hinder natural or artificial reforestation.

The Loring and Memphis soils are well suited to habitat for woodland wildlife.

The soils in this map unit are poorly suited to urban uses and sanitary facilities. The slope is the main limitation. The soils are poorly suited to septic tank absorption fields because of the slope of all three soils and the restricted permeability in the Loring soil. Low strength is a limitation on sites for local roads and streets in areas of the Loring and Memphis soils.

The capability subclass is VIIe.

MeB—Memphis silt loam, 2 to 6 percent slopes. This very deep, well drained, gently sloping soil is on narrow and broad ridges in the uplands throughout the survey area. Individual areas range from 3 to 40 acres in size.

Typically, the surface layer is dark brown silt loam about 9 inches thick. The subsoil extends to a depth of about 60 inches. From 9 to 14 inches, it is brown silt loam. From 14 to 32 inches, it is strong brown silty clay loam. From 32 to 60 inches, it is strong brown and brown silt loam.

This soil is low in content of organic matter. Permeability is moderate, and the available water capacity is high. Tilth is good, and the soil can be worked throughout a wide range in moisture content without excessive clodding and crusting. The root zone

is very deep and can be easily penetrated by plant roots.

Included with this soil in mapping are small areas of Loring and Calloway soils. These soils are in landscape positions similar to those of the Memphis soil. Also included are areas of Memphis soils that have slopes of more than 6 percent and areas that are eroded. Included soils make up less than 15 percent of this map unit, and individual areas of the included soils generally are less than 3 acres in size.

Most areas are used for row crops, such as corn, soybeans, wheat, and milo. Some areas are used for hay or pasture.

This soil is well suited to the cultivated crops commonly grown in the survey area. If the soil is cultivated, the hazard of erosion is moderate. Measures that slow surface runoff, help to control erosion, and ensure continued high crop yields are needed. Examples are conservation tillage, contour farming, stripcropping, cover crops, a cropping sequence that includes grasses and legumes, and applications of lime and fertilizer according to the needs of the crop. Leaving crop residue on or near the surface and incorporating it into the plow layer can help to maintain good tilth and the content of organic matter.

If properly managed, this soil is well suited to most pasture and hay plants. The species that produce adequate forage and provide a satisfactory ground cover should be selected for planting. The desired species can be maintained by frequent pasture renovation. Applications of lime and fertilizer, proper stocking rates, rotation grazing, and control of undesirable vegetation are some of the management needs.

This soil is well suited to woodland. The species that are preferred for planting include yellow-poplar, loblolly pine, sweetgum, black walnut, white ash, and white oak. Table 7 provides specific information relating to potential productivity.

The main concern in managing woodland is plant competition. Without intensive site preparation and maintenance, undesirable plants hinder natural or artificial reforestation.

This soil is well suited to habitat for openland and woodland wildlife.

This soil is well suited to most urban uses and sanitary facilities, including septic tank absorption fields. Low strength is a limitation on sites for local roads and streets.

The capability subclass is IIe.

MeC2—Memphis silt loam, 6 to 12 percent slopes, eroded. This very deep, well drained, sloping soil is on narrow, convex ridges and side slopes in the uplands throughout the survey area. About 25 to 75 percent of the original surface layer has been removed by erosion. Individual areas range from 3 to 25 acres in size.

Typically, the surface layer is dark yellowish brown silt loam about 6 inches thick. The subsoil extends to a depth of 60 inches. It is brown silty clay loam in the upper part and strong brown silt loam in the lower part.

This soil is low in content of organic matter. Permeability is moderate, and the available water capacity is high. Tilth is good, and the soil can be worked throughout a wide range of moisture conditions without excessive clodding and crusting. The root zone is very deep and can be easily penetrated by plant roots.

Included with this soil in mapping are small areas of Loring soils. Also included are areas of Memphis soils that have slopes of more than 12 percent or less than 6 percent and areas that are severely eroded. Included soils make up less than 10 percent of this map unit, and individual areas of the included soils generally are less than 3 acres in size.

Most areas are used for row crops, such as soybeans, corn, milo, and wheat. Some areas are used for hay or pasture.

This soil is suited to the cultivated crops commonly grown in the survey area. If the soil is cultivated, the hazard of erosion is severe. Measures that slow surface runoff, help to control erosion, and ensure continued high crop yields are needed. Examples are conservation tillage, contour farming, stripcropping, cover crops, a cropping sequence that includes grasses and legumes, and applications of lime and fertilizer according to the needs of the crop. Leaving crop residue on or near the surface and incorporating it into the plow layer can help to maintain good tilth and increase the content of organic matter.

This soil is suited to pasture and hay. Planting the species that produce adequate forage and provide a satisfactory ground cover helps to control erosion. The desired species can be maintained by frequent pasture renovation. Applications of lime and fertilizer, proper stocking rates, rotation grazing, and control of undesirable vegetation are some of the management needs.

This soil is well suited to woodland. The native trees are upland oaks and hickory. The species that are preferred for planting include yellow-poplar, loblolly pine, sweetgum, black walnut, white ash, and white oak. Table 7 provides specific information relating to potential productivity.

The main concern in managing woodland is plant competition. Without intensive site preparation and maintenance, undesirable plants hinder natural or artificial reforestation.

This soil is well suited to habitat for openland and woodland wildlife.

This soil is suited to most urban uses and sanitary facilities. The slope is the main limitation. The soil is suited to septic tank absorption fields. Low strength is a limitation on sites for local roads and streets. Proper design and installation can help to overcome or minimize some of the limitations affecting these uses.

The capability subclass is IIIe.

MmF3—Memphis-Molena complex, 20 to 40 percent slopes, severely eroded. These very deep, well drained and somewhat excessively drained, steep and very steep soils are on side slopes in the uplands. The two soils occur as areas so intricately mixed or so small that they could not be mapped separately at the selected scale. Erosion has removed most of the original surface layer and, in places, some of the subsoil. Some areas have moderately deep or deep gullies. The Memphis soil has slopes of as much as 40 percent, and the Molena soil has slopes of as much as 35 percent. Individual areas range from 10 to more than 200 acres in size.

Memphis silt loam makes up about 50 percent of this map unit, and Molena fine sandy loam makes up about 20 percent. Other soils make up about 30 percent.

Typically, the surface layer of the Memphis soil is dark yellowish brown silt loam about 6 inches thick. The subsoil extends to a depth of about 60 inches. It is brown silty clay loam in the upper part and strong brown silt loam in the lower part.

The Memphis soil is low in content of organic matter. Permeability is moderate, and the available water capacity is high. The root zone is very deep and can be easily penetrated by plant roots.

Typically, the surface layer of the Molena soil is very dark grayish brown loamy sand about 2 inches thick. The subsoil extends to a depth 60 inches or more. From 2 to 6 inches, it is dark brown loamy sand. From 6 to 12 inches, it is yellowish brown sand. From 12 to 60 inches, it is yellowish brown and strong brown loamy sand that has lamellae of fine sandy loam.

The Molena soil is low in content of organic matter. Permeability is rapid, and the available water capacity is low. The root zone is very deep and can be easily penetrated by plant roots.

Included with these soils in mapping are small areas of Loring and Saffell soils. These included soils are in landscape positions similar to those of the Memphis and Molena soils. Also included are loamy soils that have a fragipan over loamy coastal plain sediments, loamy soils that have concretions of calcium carbonate, coastal plain soils that have more sand than the Memphis soil and more clay than the Molena soil, clayey soils, vertical escarpments, and areas where slopes are less than 20 percent or more than 40 percent. Included soils make up less than 30 percent of this map unit, and individual areas of the included soils generally are less than 3 acres in size.

This map unit is wooded. Mainly because of the slope and a severe hazard of erosion, it is not suited to cultivated crops, hay, or pasture. It is suited to woodland. Upland oaks and hickory are some of the native trees. The species that are preferred for planting include yellow-poplar, white oak, white ash, and loblolly pine. Table 7 provides specific information relating to potential productivity.

The main concerns in managing woodland are the hazard of erosion, an equipment limitation, seedling mortality, and plant competition. Steep skid trails and firebreaks are subject to rilling and gullying unless they are protected by adequate water bars, a plant cover, or both. The slope restricts the use of wheeled and tracked equipment on skid trails. Cable yarding generally is safer than operating this equipment and results in less surface disturbance. The seedling mortality rate may be high in summer because of a scarcity of moisture. Without intensive site preparation and maintenance, undesirable plants hinder natural or artificial reforestation.

The Memphis soil is well suited to habitat for woodland wildlife.

The soils in this map unit are poorly suited to urban uses and sanitary facilities. The slope is the main limitation. The soils are poorly suited to septic tank absorption fields because of the slope of both soils and a poor filtering capacity in the Molena soil. Low strength is a limitation on sites for local roads and streets in areas of the Memphis soil.

The capability subclass is VIIe.

Mo—Mhoon silt loam, ponded. This very deep, poorly drained, nearly level soil is on flood plains along the major streams. It remains under shallow water throughout most of the year. Individual areas range from 5 to more than 200 acres in size.

Typically, the surface layer is dark grayish brown silt loam about 10 inches thick. The subsoil extends to a depth of about 40 inches. It is gray, mottled silt loam. The substratum, from a depth of 40 to 60 inches, also is gray, mottled silt loam.

This soil is moderate in content of organic matter. Permeability is slow, and the available water capacity is high. The seasonal high water table is 12 inches or more above to 36 inches below the surface. The shrink-swell potential is moderate in the subsoil. The root zone is very deep and can be easily penetrated by plant roots. The soil is frequently flooded for long or very long

Figure 11.—An area of Mhoon silt loam, ponded, which provides excellent habitat for wetland wildlife.

periods in winter and spring and is ponded throughout most of the year.

Included with this soil in mapping are small areas of Adler, Convent, and Dekoven soils. These soils are in landscape positions similar to those of the Mhoon soil. Also included are small areas of Calloway, Center, and Routon soils on low stream terraces. Included soils make up less than 10 percent of this map unit, and individual areas of the included soils generally are less than 3 acres in size.

Most areas are in marshes. In places the marshes are surrounded by trees. Some areas are in wooded swamps.

This soil is not suited to cultivated crops, pasture, or hay. The ponding and the frequent flooding are the main management concerns.

This soil is suited to woodland. Black willow and silver maple are some of the native trees. The species that are preferred for planting include green ash, eastern cottonwood, sweetgum, and American sycamore. Table 7 provides specific information relating to potential productivity.

The main concerns in managing woodland are an equipment limitation, seedling mortality, and plant competition. The seasonal high water table restricts the use of equipment to periods when the soil is dry. The seedling mortality rate may be high in areas that are subject to flooding. Without intensive site preparation and maintenance, undesirable plants hinder natural or artificial reforestation.

This soil is well suited to habitat for wetland wildlife (fig. 11).

This soil is poorly suited to urban uses and sanitary facilities. The hazard of flooding and the wetness are the main management concerns. The soil is poorly suited to septic tank absorption fields because of the

hazard of flooding, the wetness, and the restricted permeability. Low strength is a limitation on sites for local roads and streets.

The capability subclass is Vw.

Op—Openlake silty clay, frequently flooded. This very deep, somewhat poorly drained, nearly level soil is on flood plains along the Mississippi River. Individual areas range from 10 to more than 200 acres in size.

Typically, the surface layer is very dark grayish brown, mottled silty clay about 8 inches thick. The subsoil extends to a depth of about 65 inches. From 8 to 20 inches, it is dark grayish brown, mottled silty clay. From 20 to 27 inches, it is dark gray, mottled silty clay. From 27 to 52 inches, it is dark grayish brown, mottled silty clay loam and silty clay. From 52 to 65 inches, it is dark gray, mottled silty clay.

This soil is moderate in content of organic matter. Permeability is very slow, and the available water capacity is high. Tilth is poor, and the soil clods and crusts unless it is tilled within the proper moisture conditions. Depth to the seasonal high water table ranges from 18 to 36 inches. The root zone is very deep and can be easily penetrated by plant roots. The shrink-swell potential is high. The soil is frequently flooded for brief or long periods in winter and spring.

Included with this soil in mapping are small areas of Mhoon, Commerce, and Keyespoint soils. These soils are in landscape positions similar to those of the Openlake soil. Also included are areas that are ponded, clayey soils that are moderately well drained, soils that have more sand than the Openlake soil, and areas where slopes range from 2 to 4 percent. Included soils make up less 20 percent of this map unit, and individual areas of the included soils generally are less than 3 acres in size.

Most areas are used as woodland. Some areas are used for soybeans or corn. This soil generally is not used for pasture or hay.

This soil is suited to the cultivated crops commonly grown in the survey area. It is not suited to small grain because of the hazard of flooding. Restricting tillage to periods of favorable moisture conditions helps to prevent clodding and crusting. Open drainage ditches in combination with grassed waterways or tile drainage systems can remove excess water. In some years crops are damaged by flooding. Returning crop residue to the soil, establishing cover crops, and including grasses and legumes in the cropping sequence help to maintain desirable soil structure, improve tilth, and increase the content of organic matter.

This soil is well suited to woodland. Silver maple and black willow are some of the native trees. The species that are preferred for planting include green ash, eastern cottonwood, sweetgum, pecan, loblolly pine, and American sycamore. Table 7 provides specific information relating to potential productivity.

The main concerns in managing woodland are an equipment limitation, seedling mortality, and plant competition. The seasonal high water table restricts the use of equipment to periods when the soil is dry. Without intensive site preparation and maintenance, undesirable plants hinder natural or artificial reforestation. The seedling mortality rate may be high in areas that are subject to flooding.

This soil is well suited to habitat for woodland wildlife.

This soil is poorly suited to urban uses and sanitary facilities. The wetness, the high shrink-swell potential, and the hazard of flooding are the main management concerns. The soil is poorly suited to septic tank absorption fields because of the hazard of flooding, the wetness, and the restricted permeability. Low strength is a limitation on sites for local roads and streets.

The capability subclass is IVw.

Pt—Pits-Dumps complex. This map unit consists of areas that have been mined for gravel, sand, or clay. The soil material has been removed, and the underlying material is used as roadbed material or as fill material on construction sites. A few areas are mined for high-grade clay used in the manufacture of fine china, porcelain, sanitary hardware, and tile. Individual areas range from 10 to 75 acres in size.

Pits make up about 45 percent of this map unit, Dumps make up about 35 percent, and inclusions make up about 20 percent.

Included in this unit in mapping are small areas of Memphis, Loring, and Saffell soils. Also included are some areas where water ponds at the bottom of the pits.

Pits are open excavations from which soil and the underlying material have been removed and stratified coastal plain deposits that support few plants are exposed. Typically, the pits have vertical walls that are 10 to 100 feet deep.

Dumps are areas of smooth or uneven accumulations or piles of mining spoil. Most of these areas cannot support plants without major reclamation.

The capability subclass is VIIs.

Rc—Robinsonville-Crevasse complex, frequently flooded. These very deep, well drained and excessively drained, nearly level soils are on flood plains along the Mississippi River. The two soils occur as areas so intricately mixed or so small that they could not be mapped separately at the selected scale. Individual areas range from 5 to more than 125 acres in size.

Robinsonville silt loam makes up about 55 percent of

this map unit, and Crevasse sand makes up about 25 percent. Other soils make up about 20 percent.

Typically, the surface layer of the Robinsonville soil is dark brown silt loam about 8 inches thick. The underlying material extends to a depth of about 46 inches. From 8 to 13 inches, it is dark brown loam. From 13 to 46 inches, it is dark brown and dark yellowish brown very fine sandy loam. A buried layer extends from a depth of 46 to 60 inches. It is dark grayish brown and dark brown silt loam.

The Robinsonville soil is low in content of organic matter. Permeability is moderate or moderately rapid, and the available water capacity is high. Tilth is good, and the soil can be worked throughout a wide range in moisture content without excessive clodding and crusting. Depth to the seasonal high water table ranges from 4 to 6 feet. The root zone is very deep and can be easily penetrated by plant roots. The soil is frequently flooded for brief or long periods in winter and spring.

Typically, the surface layer of the Crevasse soil is brown and grayish brown sand about 13 inches thick. The substratum extends to a depth of about 60 inches. It is grayish brown and yellowish brown sand and fine sand.

The Crevasse soil is low in content of organic matter. Permeability is rapid, and the available water capacity is very low. Tilth is poor because of a high content of sand. Depth to the seasonal high water table ranges from 3.5 to 6.0 feet. The root zone is very deep and can be easily penetrated by plant roots. The soil is frequently flooded for brief or long periods in winter and spring.

Included with these soils in mapping are small areas of Bardwell, Commerce, Bowdre, and Keyespoint soils. These included soils are in landscape positions similar to those of the Robinsonville and Crevasse soils. Also included are areas of soils on narrow, steep riverbanks. Included soils make up less than 20 percent of this map unit, and individual areas of the included soils generally are less than 3 acres in size.

Most areas are used for row crops, such as soybeans, milo, and corn. Some areas are wooded. This map unit generally is not used for pasture or hay.

These soils are suited to the cultivated crops commonly grown in the survey area. They are not suited to small grain because of the hazard of flooding. Returning crop residue to the soils, establishing cover crops, and including grasses and legumes in the cropping sequence help to maintain desirable soil structure, improve tilth, and increase the content of organic matter.

These soils are well suited to woodland. The species that are preferred for planting include eastern cottonwood, sweetgum, green ash, and American sycamore. Table 7 provides specific information relating to potential productivity.

The main concerns in managing woodland are an equipment limitation and seedling mortality. Also, plant competition is a management concern on the Robinsonville soil. The sandy surface layer in the Crevasse soil hinders the use of wheeled and tracked equipment, especially when the soil is saturated or very dry. The seedling mortality rate may be high in areas that are subject to flooding. Without intensive site preparation and maintenance, undesirable plants hinder natural or artificial reforestation.

The Robinsonville soil is suited to habitat for woodland wildlife.

The soils in this map unit are poorly suited to most urban uses and sanitary facilities because of the hazard of flooding. They are poorly suited to septic tank absorption fields because of the hazard of flooding on both soils and wetness and a poor filtering capacity in the Crevasse soil.

The capability subclass is IVw.

RnA—Routon-Center silt loams, 0 to 2 percent slopes, rarely flooded. These very deep, poorly drained to moderately well drained, nearly level soils are on low stream terraces. The two soils occur as areas so intricately mixed or so small that they could not be mapped separately at the selected scale. Individual areas range from 5 to more than 150 acres in size.

Routon silt loam makes up about 50 percent of this map unit, and Center silt loam makes up about 20 percent. Other soils make up about 30 percent.

The surface layer of the Routon soil is brown, mottled silt loam about 10 inches thick. The subsoil extends to a depth of about 60 inches. It is gray, mottled silt loam in the upper 6 inches and light brownish gray, mottled silty clay loam in the lower 44 inches.

The Routon soil is low in content of organic matter. Permeability is slow, and the available water capacity is high. Tilth is good, and the soil can be worked throughout a wide range in moisture content without excessive clodding and crusting. The seasonal high water table is within a depth of 12 inches. The root zone is very deep and can be easily penetrated by plant roots. The soil is subject to rare flooding during winter and spring.

Typically, the surface layer of the Center soil is dark brown silt loam about 6 inches thick. The subsoil extends to a depth of about 50 inches. From 6 to 21 inches, it is yellowish brown, mottled silty clay loam. From 21 to 37 inches, it is light brownish gray, mottled silty clay loam. From 37 to 50 inches, it grayish brown,

yellowish brown, and brown silty clay loam and silt loam. The substratum, from a depth of 50 to about 60 inches, is yellowish brown, brown, and grayish brown silt loam.

The Center soil is moderate in content of organic matter. Permeability is moderately slow, and the available water capacity is high. Tilth is good, and the soil can be worked throughout a wide range in moisture content without excessive clodding and crusting. Depth to the seasonal high water table ranges from 12 to 30 inches. The root zone is very deep and can be easily penetrated by plant roots. The soil is subject to rare flooding in winter and spring.

Included with these soils in mapping are small areas of Calloway soils. These included soils are in landscape positions similar to those of the Routon and Center soils. Also included are small areas of Dekoven, Adler, Convent, and Mhoon soils on flood plains; small areas of soils that have a high content of sodium and support few plants; areas where slopes range from 2 to 4 percent; clayey soils; areas that are occasionally flooded; areas of soils that have a surface layer of thick overwash; and small areas of soils that are similar to the Routon soil but are somewhat poorly drained. Included soils make up less than 30 percent of this map unit, and individual areas of the included soils generally are less than 3 acres in size.

Most areas are used for row crops, such as soybeans, corn, milo, and wheat. Some areas are wooded.

These soils are suited to the cultivated crops commonly grown in the survey area. Removing excess water improves the suitability for these crops. Cultivating and harvesting are delayed in some years because of the wetness. Returning crop residue to the soils, establishing cover crops, and including grasses and legumes in the cropping sequence help to maintain desirable soil structure, improve tilth, and increase the content of organic matter.

These soils are suited to pasture and hay, but the flooding and the wetness are management concerns. A drainage system, control of weeds, proper stocking rates, rotation grazing, and applications of fertilizer and lime can increase forage production. The pasture and hay species that can tolerate seasonal wetness and flooding should be selected for planting.

These soils are suited to woodland. The species that are preferred for planting include sweetgum, loblolly pine, green ash, and eastern cottonwood. Table 7 provides specific information relating to potential productivity.

The main concerns in managing woodland are plant competition on both soils and an equipment limitation and seedling mortality on the Routon soil. The seasonal high water table restricts the use of equipment to periods when the soils are dry. Without intensive site preparation and maintenance, undesirable plants hinder natural or artificial reforestation. The seedling mortality rate may be high in areas that are subject to flooding.

The Center soil is suited to habitat for openland and woodland wildlife.

The soils in this map unit are poorly suited to most urban uses and sanitary facilities because of the hazard of flooding and the wetness. They are poorly suited to septic tank absorption fields because of the wetness and the restricted permeability. Low strength is a limitation on sites for local roads and streets. Proper design and installation can help to overcome or minimize some of the limitations affecting these uses.

The capability subclass is IIIw.

RtA—Routon-Center silt loams, 0 to 2 percent slopes, occasionally flooded. These very deep, poorly drained to moderately well drained, nearly level soils are on low stream terraces. The two soils occur as areas so intricately mixed or so small that they could not be mapped separately at the selected scale. Individual areas range from 10 to more than 150 acres in size.

Routon silt loam makes up about 50 percent of this map unit, and Center silt loam makes up about 20 percent. Other soils make up about 30 percent.

The surface layer of the Routon soil is brown, mottled silt loam about 10 inches thick. The subsoil extends to a depth of about 60 inches. It is gray, mottled silt loam in the upper part and light brownish gray, mottled silty clay loam in the lower part.

The Routon soil is low in content of organic matter. Permeability is slow, and the available water capacity is high. Tilth is good, and the soil can be worked throughout a wide range in moisture content without excessive clodding and crusting. The seasonal high water table is within a depth of 12 inches. The root zone is very deep and can be easily penetrated by plant roots. The soil is occasionally flooded for very brief periods during winter and spring.

Typically, the surface layer of the Center soil is dark brown silt loam about 6 inches thick. The subsoil extends to a depth of about 50 inches. It is yellowish brown, mottled silty clay loam in the upper part and light brownish gray, grayish brown, yellowish brown, and brown silty clay loam and silt loam in the lower part. The substratum, from a depth of 50 to about 60 inches, is yellowish brown, brown, and grayish brown silt loam.

The Center soil is moderate in content of organic matter. Permeability is moderately slow, and the available water capacity is high. Tilth is good, and the soil can be worked throughout a wide range in moisture

content without excessive clodding and crusting. Depth to the seasonal high water table ranges from 12 to 30 inches. The root zone is very deep and can be easily penetrated by plant roots. The soil is occasionally flooded for very brief periods in winter and spring.

Included with these soils in mapping are small areas of Calloway soils. These included soils are in landscape positions similar to those of the Routon and Center soils. Also included are small areas of Dekoven, Adler, Convent, and Mhoon soils on flood plains; areas of soils that have a high content of sodium and support few plants; areas where slopes range from 2 to 4 percent; clayey soils; areas that are frequently flooded; areas that have a surface layer of overwash; and small areas of soils that are similar to the Routon soil but are somewhat poorly drained. Included soils make up less than 30 percent of this map unit, and individual areas of the included soils generally are less than 3 acres in size.

Most areas are used for row crops, such as soybeans, corn, and milo. Some areas are wooded.

These soils are suited to the cultivated crops commonly grown in the survey area. They are not suited to small grain because of the hazard of flooding. Removing excess water improves the suitability for cultivated crops. Cultivation and harvesting are delayed in some years because of the wetness. Returning crop residue to the soils, establishing cover crops, and including grasses and legumes in the cropping sequence help to maintain desirable soil structure, improve tilth, and increase the content of organic matter.

These soils are suited to pasture and hay, but the flooding and the wetness are management concerns. A drainage system, control of weeds, proper stocking rates, rotation grazing, and applications of fertilizer and lime can increase forage production. The pasture and hay species that can tolerate seasonal wetness and flooding should be selected for planting.

These soils are suited to woodland. The species that are preferred for planting include sweetgum, cherrybark oak, green ash, and eastern cottonwood. Table 7 provides specific information relating to potential productivity.

The main concerns in managing woodland are plant competition on both soils and an equipment limitation and seedling mortality on the Routon soil. The seasonal high water table restricts the use of equipment to periods when the soils are dry. Without intensive site preparation and maintenance, undesirable plants hinder natural or artificial reforestation. The seedling mortality rate may be high in areas that are subject to flooding.

The Center soil is suited to habitat for openland and woodland wildlife.

The soils in this map unit are poorly suited to most urban uses and sanitary facilities because of the wetness and the hazard of flooding. They are poorly suited to septic tank absorption fields because of the hazard of flooding, the wetness, and the restricted permeability. Low strength is a limitation on sites for local roads and streets. Proper design and installation can help to overcome or minimize some of the limitations affecting these uses.

The capability subclass is IIIw.

Prime Farmland

In this section, prime farmland is defined and the soils in Carlisle and Hickman Counties that are considered prime farmland are listed.

Prime farmland is one of several kinds of important farmland defined by the U.S. Department of Agriculture. It is of major importance in meeting the Nation's short- and long-range needs for food and fiber. The acreage of high-quality farmland is limited, and the U.S. Department of Agriculture recognizes that local, State, and Federal levels, as well as individuals, must encourage and facilitate the wise use of our Nation's prime farmland.

Prime farmland soils, as defined by the U.S. Department of Agriculture, are soils that are best suited to food, feed, forage, fiber, and oilseed crops (fig. 12). Such soils have properties that favor the economic production of sustained high yields of crops. The soils need only to be treated and managed by acceptable farming methods. The moisture supply must be adequate, and the growing season must be sufficiently long. Prime farmland soils produce the highest yields with minimal expenditure of energy and economic resources. Farming these soils results in the least damage to the environment.

Prime farmland soils may presently be used as cropland, pasture, or woodland or for other purposes. They are used for food or fiber or are available for these uses. Urban or built-up land is any contiguous unit of land 10 acres or more in size that is used for such purposes as housing, industrial, and commercial sites, sites for institutions or public buildings, small parks, golf courses, cemeteries, railroad yards, airports, sanitary landfills, sewage treatment plants, and water-control structures. Public land is land not available for farming in National forests, National parks, military reservations, and State parks.

Prime farmland soils usually receive an adequate and dependable supply of moisture from precipitation or irrigation. The temperature and growing season are favorable. The acidity or alkalinity of the soils is acceptable. The soils have few or no rocks and are permeable to water and air. They are not excessively erodible or saturated with water for long periods and are not frequently flooded during the growing season. The slope ranges mainly from 0 to 6 percent.

The following map units are considered prime farmland in Carlisle and Hickman Counties. The location of each map unit is shown on the detailed soil maps at the back of this publication. The extent of each unit is given in table 4. The soil qualities that affect use and management are described in the section "Detailed Soil Map Units." This list does not constitute a recommendation for a particular land use.

Some soils that have a high water table and all soils that are frequently flooded during the growing season qualify as prime farmland only in areas where these limitations have been overcome by drainage measures or flood control. If applicable, the need for these measures is indicated in parentheses after the map unit name in the following list. Onsite evaluation is necessary to determine if the limitations have been overcome by corrective measures.

The soils identified as prime farmland in Carlisle and Hickman Counties are:

Ad Adler silt loam, frequently flooded (where protected from flooding or not frequently flooded during the growing season)
Bd Bardwell silt loam, frequently flooded (where protected from flooding or not frequently flooded during the growing season)
Br Bowdre-Robinsonville complex, frequently flooded (where drained and either protected from flooding or not frequently flooded during the growing season)
CaA Calloway silt loam, 0 to 3 percent slopes (where drained)
CbA Calloway silt loam, 0 to 2 percent slopes, rarely flooded (where drained)
CeA Center silt loam, 0 to 3 percent slopes, rarely flooded (where drained)
Cm Commerce silt loam, frequently flooded (where drained and either protected from flooding or not frequently flooded during the growing season)

Figure 12.—High-quality hayland in an area of Memphis silt loam, 2 to 6 percent slopes. This soil is considered prime farmland.

Cn Convent-Adler silt loams, frequently flooded (where drained and either protected from flooding or not frequently flooded during the growing season)
Ct Convent-Mhoon silt loams, frequently flooded (where drained and either protected from flooding or not frequently flooded during the growing season)
De Dekoven silt loam, overwash, occasionally flooded (where drained)
Iu Iuka sandy loam, occasionally flooded
Kb Keyespoint and Bardwell soils, frequently flooded (where drained and either protected from flooding or not frequently flooded during the growing season)
LoB Loring silt loam, 2 to 6 percent slopes
MeB Memphis silt loam, 2 to 6 percent slopes
Op Openlake silty clay, frequently flooded (where drained and either protected from flooding or not frequently flooded during the growing season)
Rc Robinsonville-Crevasse complex, frequently flooded (where protected from flooding or not frequently flooded during the growing season)
RnA Routon-Center silt loams, 0 to 2 percent slopes, rarely flooded (where drained)
RtA Routon-Center silt loams, 0 to 2 percent slopes, occasionally flooded (where drained)

Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help to prevent soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavioral characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreational facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

Crops and Pasture

William H. Amos, Jr., agronomist, Natural Resources Conservation Service, helped prepare this section.

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils, including some not commonly grown in the survey area, are identified; the system of land capability classification used by the Natural Resources Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under the heading "Detailed Soil Map Units." Specific information can be obtained from the local office of the Natural Resources Conservation Service or the Kentucky Cooperative Extension Service.

In 1982, about 209,200 acres in the survey area was used for crops or pasture. In Carlisle County, 28,400 acres was used for pasture and 59,300 acres was used for cultivated crops. In Hickman County, 9,100 acres was used for pasture and 112,400 acres was used for cultivated crops *(25)*. The main cultivated crops in the survey area are soybeans, corn, milo, and wheat. Barley, burley tobacco, dark air-cured tobacco, and dark fire-cured tobacco are grown on small acreages. Specialty crops, such as vegetables and fruit crops, are not extensively grown in the survey area. Strawberries and tomatoes are the most commonly grown specialty crops. The latest information about growing cultivated crops or specialty crops is available from local offices of the Kentucky Cooperative Extension Service and the Natural Resources Conservation Service.

Erosion is the major concern on about 60 percent of the cropland and pasture in the survey area. Soils that have slopes of more than 2 percent are susceptible to excessive erosion if cultivated. Loring and Memphis soils, for example, have slopes of more than 2 percent.

Loss of the surface layer through erosion is damaging for two reasons. First, productivity is reduced as the surface layer is lost and material from the subsoil is incorporated into the plow layer. Loss of the surface layer is especially damaging on soils that have a layer in or below the subsoil that limits the depth of the root zone. Such layers include the fragipan in Loring soils. On eroded soils tilling or preparing a good seedbed is

difficult because of the loss of the original friable surface layer. Second, erosion on farmland results in the sedimentation of streams. Control of erosion minimizes this pollution and improves the quality of water for municipal use, for recreation, and for fish and wildlife.

The hazard of erosion can be reduced by the application of certain management practices. In general, erosion-control measures provide a protective cover, reduce the runoff rate, and increase the rate of water infiltration. A cropping system that keeps a plant cover on the soil for extended periods can hold erosion losses to amounts that will not reduce the productivity capacity of the soil. On livestock farms, which require pasture and hay, including grasses and legumes in the cropping sequence helps to control erosion on sloping land, provides nitrogen, and improves tilth for subsequent crops.

On sloping soils a cropping sequence that provides a substantial plant cover is needed to control erosion unless a system of conservation tillage is applied. Minimizing tillage and leaving crop residue on the surface increase the rate of water infiltration and reduce the hazards of runoff and erosion. These practices can be adapted to most of the soils in Carlisle and Hickman Counties. Conservation tillage, including no-till farming, commonly reduces the hazard of erosion on sloping land.

Information about the design of erosion-control measures for each kind of soil is available in local offices of the Natural Resources Conservation Service.

Wetness is a management concern on about 22 percent of the soils in Carlisle and Hickman Counties. Some of the soils are so wet that production of the crops commonly grown in the counties is not possible.

Unless drained, somewhat poorly drained to very poorly drained soils are either poorly suited to most crops or produce low crop yields in most years. Bowdre, Calloway, Center, Commerce, Convent, Dekoven, Keyespoint, Mhoon, Openlake, and Routon soils, which make up about 60,000 acres in the survey area, are examples. Planting and harvesting are often delayed on these soils because of excessive wetness.

Natural fertility is low or medium in most of the soils in the survey area. It is high, however, in some of the soils on the bottom land along the Mississippi River. Different plants require different levels of pH and nutrients for optimum growth. Additions of lime and fertilizer should be based on the results of soil tests. The Kentucky Cooperative Extension Service can help to determine the kind and amounts of lime and fertilizer needed.

Maintenance of soil structure and tilth is essential in maintaining soil fertility. Working the soil when it is too wet destroys soil structure and tilth. Poor soil structure restricts soil aeration, microbial activity, and the ability of the soil to provide plant nutrients.

Soil structure and tilth have important effects on seed germination, root penetration, soil fertility, and permeability. Soils that are characterized by good structure and tilth are friable and porous. They allow roots to penetrate and shoots to emerge easily. Excessive tillage, especially when the soils are too wet, breaks down soil structure and may result in surface crusting or clodding. Surface crusting restricts the ability of the soils to provide the proper combination of air and water to plants and the availability of micro-organisms and nutrients and increases the runoff rate. Regular additions of crop residue, manure, and other organic material can improve soil structure and minimize crusting.

Pasture and hayland contribute significantly to agricultural production in Carlisle and Hickman Counties. The extent of the areas used for pasture or hay has decreased regularly, however, over the last 20 years. Most of the hayland and pasture supports a mixture of grasses and legumes. When harvested, most of the hay is rolled into large, round bales (fig. 13).

In 1988, the survey area had about 16,200 cattle and calves *(15)*. About 43 percent of the total farm cash receipts in Carlisle County and 23 percent of the receipts in Hickman County are derived from the sale of livestock or livestock products. As a result, properly managing the forage program is important.

A basic knowledge of soils and plants is necessary if a productive forage program is to be achieved. The soils in the survey area vary in depth to limiting layers, internal drainage, ability to supply moisture, and other properties. Grasses and legumes vary widely in their ability to persist and provide forage on different kinds of soil.

Planting forage species on compatible soils can result in the greatest return and maximum soil and water conservation. The soils that are best suited to alfalfa are those that are gently sloping, deep, and well drained. Tall fescue and other sod-forming grasses can be grown on most soils. They are most effective in minimizing erosion on moderately steep soils. Clover and grasses grow well on soils that have a water table within a depth of 2 feet.

The forage species selected for planting should be those that are suited not only to the soil but also to the intended use. The grasses and legumes commonly grown for pasture in the survey area include tall fescue, Kentucky bluegrass, orchardgrass, ladino clover, white clover, and Korean lespedeza. The grasses and legumes grown primarily for hay are tall fescue, orchardgrass, timothy, red clover, and alfalfa. Legumes

Figure 13.—Round bales of hay in an area of Loring silt loam, 2 to 6 percent slopes.

should be grown to the maximum extent possible because they generally produce higher quality feed than grasses.

Renovation is a good way to increase yields of pasture and hay. Renovation is the improvement of pasture or hayland by the partial destruction of sod, applications of lime and fertilizer, and the reestablishment of desirable forage plants through seeding *(12, 13)*.

Management practices, such as rotation grazing, the proper distribution of water supplies, and appropriate stocking levels, can improve or maintain the productivity of pasture or hayland. Additional information about pasture and hayland management is available at the local office of the Natural Resources Conservation or the Kentucky Cooperative Extension Service.

Yields per Acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 5. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors. The land capability classification of each map unit also is shown in the table.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green manure crops; and harvesting that ensures the smallest possible loss.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared

with that of other soils, however, is not likely to change.

Crops other than those shown in table 5 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Natural Resources Conservation Service or of the Kentucky Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for use as cropland. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not include major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for woodland, or for engineering purposes.

In the capability system, soils are generally grouped at three levels—capability class, subclass, and unit *(22)*. Only class and subclass are used in this survey.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main hazard is the risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c,* used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

There are no subclasses in class I because the soils of this class have few limitations. The soils in class V are subject to little or no erosion, but they have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation. Class V contains only the subclasses indicated by *w, s,* or *c.*

The acreage of soils in each capability class and subclass is shown in table 6. The capability classification of each map unit is given in the section "Detailed Soil Map Units" and in the yields table.

Woodland Management and Productivity

Charles A. Foster, forester, Natural Resources Conservation Service, helped prepare this section.

In 1982, forest made up approximately 22 percent, or 27,300 acres, of the land in Carlisle County and 19 percent, or 29,800 acres, of the land in Hickman County *(25)*. The woodland in the two counties supports pine and hardwood species (fig. 14). Loblolly pine, shortleaf pine, and white pine are planted on a wide variety of sites but are mainly on eroded soils in the uplands. Baldcypress grows on wet soils on bottom land and in swamps. Yellow-poplar, white ash, and cottonwood are important species on flood plains. Other hardwood species that are common in the survey area are white oak, southern red oak, chinkapin oak, cherrybark oak, Shumard oak, water oak, swamp chestnut oak, black oak, northern red oak, scarlet oak, willow oak, hackberry, hickory, black walnut, sweetgum, blackgum, American elm, American sycamore, American beech, red maple, black locust, dogwood, and sassafras.

Woodland tracts in Kentucky are private holdings averaging about 24 acres in size. They are essentially unmanaged. In this survey area the yield of sawtimber is approximately 3,600 board feet per acre. The annual growth is about 41 cubic feet, or 212 board feet, per acre. It is higher than is typical in most areas of Kentucky. Only about 20 percent of the forested acreage in the survey area is highly productive. About 75 percent of the forest land can produce 50 or more cubic feet per acre per year. With proper management,

Figure 14.—Well managed woodland in an area of Keyespoint and Bardwell soils, frequently flooded.

tree growth, stocking, and tree quality can be improved. This management includes the removal of low-quality trees in fully stocked and understocked stands of all sizes and the regeneration of sawtimber stands after harvest.

Presently, three commercial sawmills in the survey area produce rough lumber, dimension stock, crossties, chips, and cants. Logs or standing trees in the survey area are often purchased by mills in adjacent counties.

Soils vary in their ability to produce trees. Available water capacity and depth of the root zone have major effects on tree growth. Fertility and texture also influence tree growth. Elevation, aspect, and climate determine the kinds of trees that can grow on a site. Elevation and aspect are of particular importance in mountainous areas.

This soil survey can be used by woodland managers planning ways to increase the productivity of forest land. Some soils respond better to applications of fertilizer than others, and some are more susceptible to landslides and erosion after roads are built and timber is harvested. Some soils require special reforestation efforts. In the section "Detailed Soil Map Units," the description of each map unit in the survey area suitable for timber includes information about productivity, limitations in harvesting timber, and management concerns in producing timber. Table 7 summarizes this forestry information and rates the soils for a number of factors to be considered in management. *Slight, moderate,* and *severe* are used to indicate the degree of the major soil limitations to be considered in forest management.

Ratings of the *erosion hazard* indicate the probability that damage may occur if site preparation or harvesting activities expose the soil. The risk is *slight* if no particular preventive measures are needed under ordinary conditions; *moderate* if erosion-control measures are needed for particular silivicultural activities; and *severe* if special precautions are needed to control erosion for most silvicultural activities. Ratings of moderate or severe indicate the need for construction of higher standard roads, additional maintenance of roads, additional care in planning harvesting and reforestation activities, or the use of special equipment.

Ratings of *equipment limitation* indicate limits on the use of forest management equipment, year-round or

seasonal, because of such soil characteristics as slope, wetness, stoniness, and susceptibility of the surface layer to compaction. As slope gradient and length increase, it becomes more difficult to use wheeled equipment. On the steeper slopes, tracked equipment is needed. On the steepest slopes, even tracked equipment cannot be operated and more sophisticated systems are needed. The rating is *slight* if equipment use is restricted by wetness for less than 2 months and if special equipment is not needed. The rating is *moderate* if slopes are so steep that wheeled equipment cannot be operated safely across the slope, if wetness restricts equipment use for 2 to 6 months per year, if stoniness restricts the use of ground-based equipment, or if special equipment is needed to prevent or minimize compaction. The rating is *severe* if slopes are so steep that tracked equipment cannot be operated safely across the slope, if wetness restricts equipment use for more than 6 months per year, if stoniness restricts the use of ground-based equipment, or if special equipment is needed to prevent or minimize compaction. Ratings of moderate or severe indicate a need to choose the best suited equipment and to carefully plan the timing of harvesting and other management activities.

Ratings of *seedling mortality* refer to the probability of the death of naturally occurring or properly planted seedlings of good stock in periods of normal rainfall, as influenced by kinds of soil or topographic features. Seedling mortality is caused primarily by too much water or too little water. The factors used in rating a soil for seedling mortality are texture of surface layer, depth to a seasonal high water table and the length of the period when the water table is high, rock fragments in the surface layer, rooting depth, and the aspect of the slope. The mortality rate generally is highest on soils that have a sandy or clayey surface layer. The risk is *slight* if, after site preparation, expected mortality is less than 25 percent; *moderate* if expected mortality is between 25 and 50 percent; and *severe* if expected mortality exceeds 50 percent. Ratings of moderate or severe indicate that it may be necessary to use containerized or larger than usual planting stock or to make special site preparations, such as bedding, furrowing, installing a surface drainage system, and providing artificial shade for seedlings. Reinforcement planting is often needed if the risk is moderate or severe.

Ratings of *plant competition* indicate the likelihood of the growth or invasion of undesirable plants. Plant competition is more severe on the more productive soils, on poorly drained soils, and on soils having a restricted root zone that holds moisture. The risk is *slight* if competition from undesirable plants hinders adequate natural or artificial reforestation but does not necessitate intensive site preparation and maintenance. The risk is *moderate* if competition from undesirable plants hinders natural or artificial reforestation to the extent that intensive site preparation and maintenance are needed. The risk is *severe* if competition from undesirable plants prevents adequate natural or artificial reforestation unless the site is intensively prepared and maintained. A moderate or severe rating indicates the need for site preparation to ensure the development of an adequately stocked stand. Managers must plan site preparation measures to ensure reforestation without delays.

The *potential productivity* of *common trees* on a soil is expressed as a *site index* and *volume* number. Common trees are listed in the order of their observed general occurrence. Generally, only two or three tree species dominate. The first tree listed for each soil is the indicator species for that soil. An indicator species is a tree that is common in the area and that is generally the most productive on a given soil.

The *site index* is determined by taking height measurements and determining the age of selected trees within stands of a given species. This index is the average height, in feet, that the trees attain in a specified number of years. This index applies to fully stocked, even-aged, unmanaged stands. The estimates of the productivity of the soils in this survey are based on published data *(4, 5, 6, 7, 8, 9, 11, 19, 21)*.

The *volume* is the yield likely to be produced by the most important trees, expressed in cubic feet per acre per year.

Trees to plant are those that are used for reforestation or, under suitable conditions, natural regeneration. They are suited to the soils and can produce a commercial wood crop. The desired product, topographic position (such as a low, wet area), and personal preference are three factors among many that can influence the choice of trees for use in reforestation.

Recreation

In table 8, the soils of the survey area are rated according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewer lines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also

important. Soils subject to flooding are limited for recreational uses by the duration and intensity of flooding and the season when flooding occurs. In planning recreational facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 8, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or a combination of these measures.

The information in table 8 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 11 and interpretations for dwellings without basements and for local roads and streets in table 10.

Camp areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have gentle slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking and horseback riding should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

Wildlife Habitat

William H. Casey, biologist, Natural Resources Conservation Service, helped prepare this section.

The wildlife population in Carlisle and Hickman Counties consists of an estimated 47 species of mammals, 47 species of reptiles and amphibians, and 115 species of birds that are either summer or year-round residents. Many of the more than 200 other kinds of birds that visit Kentucky each year frequent the two counties during part of the year.

The wildlife species most often hunted in the survey area are cottontail rabbit, gray squirrel, fox squirrel, raccoon, red fox, white-tailed deer, bobwhite quail, and mourning dove. The furbearers regularly taken by commercial trappers are muskrat, raccoon, opossum, red fox, gray fox, mink, skunk, beaver, coyote, and weasel. The species sought by "nonconsumptive" users, such as bird-watchers and photographers, are gaining in popularity. They include the species that visit the survey area only occasionally and the species that are extremely shy and seldom seen. Examples are bald eagle, sandhill crane, and river otter.

Wildlife species thought to be in danger of extinction are of concern, especially to scientists. The ranges of nine species that have been declared either threatened or endangered by the U.S. Fish and Wildlife Service are known to include Carlisle and Hickman Counties. These species are Indiana bat, gray bat, eastern cougar, bald eagle, American peregrine falcon, Arctic peregrine falcon, least tern, bachman's warbler, and ivory-billed woodpecker.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 9, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife *(29)*. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting

soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flooding. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, oats, and barley.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flooding, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, Kentucky bluegrass, orchardgrass, white clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flooding. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestem, goldenrod, beggarweed, aster, tickclover, and cinquefoil.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, available water capacity, and wetness. Examples of these plants are oak, poplar, cherry, sweetgum, apple, hawthorn, dogwood, hickory, blackberry, and blueberry. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are Russian-olive, autumn-olive, and crabapple.

Coniferous plants furnish browse and seeds. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are Virginia pine, white pine, and redcedar.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, slope, and surface stoniness. Examples of wetland plants are smartweed, wild millet, cattail, rushes, sedges, and reeds.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. Wildlife attracted to these areas include bobwhite quail, meadowlark, field sparrow, cottontail, and red fox.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, ruffed grouse, woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, deer, and bear.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, muskrat, mink, and beaver.

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. Ratings are given

for building site development, sanitary facilities, construction materials, and water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil Properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations should be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 or 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kinds of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to evaluate the potential of areas for residential, commercial, industrial, and recreational uses; make preliminary estimates of construction conditions; evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; plan detailed onsite investigations of soils and geology; locate potential sources of gravel, sand, earthfill, and topsoil; plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Building Site Development

Table 10 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock or a very firm, dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and depth to the water table.

Dwellings and *small commercial buildings* are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, and shrinking and swelling cause the movement of footings. Depth to a high water table, depth to bedrock, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 or 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material; a base

of gravel, crushed rock, or stabilized soil material; and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, and depth to a high water table affect the traffic-supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock, and the available water capacity in the upper 40 inches affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

Sanitary Facilities

Table 11 shows the degree and kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 11 also shows the suitability of the soils for use as daily cover for landfill. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, depth to a high water table, depth to bedrock, and flooding affect absorption of the effluent. Large stones and bedrock interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 11 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, depth to a high water table, depth to bedrock, flooding, and large stones.

Excessive seepage resulting from rapid permeability in the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. Slope and bedrock can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground-water pollution. Ease of excavation and revegetation should be considered.

The ratings in table 11 are based on soil properties, site features, and observed performance of the soils.

Permeability, depth to bedrock, depth to a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, and soil reaction affect trench landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, rock fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock or the water table to permit revegetation. The soil material used as the final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Construction Materials

Table 12 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a *probable* or *improbable* source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help to determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, a low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have a moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet and have a water table at a depth of less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and *gravel* are natural aggregates suitable for commercial use with a minimum of processing. They are used in many kinds of construction. Specifications for each use vary widely. In table 12, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also

evaluated is the reclamation potential of the borrow area.

Plant growth is affected by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, and bedrock.

Soils rated *good* have friable, loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are naturally fertile or respond well to fertilizer and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel or stones, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel or stones, have slopes of more than 15 percent, or have a seasonal high water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and releases a variety of plant nutrients as it decomposes.

Water Management

Table 13 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas and for embankments, dikes, and levees. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives the restrictive features that affect each soil for drainage, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones. A high water table affects the amount of usable material. It also affects trafficability.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock or to other layers that affect the rate of water movement, permeability, depth to a high water table or depth of standing water if the soil is subject to ponding, slope, and susceptibility to flooding. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock, large stones, slope, and the hazard of cutbanks caving. Availability of drainage outlets is not considered in the ratings.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to control erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock affect the construction of grassed waterways. Low available water capacity, restricted rooting depth, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics. These results are reported in table 19.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas *(23)*. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help to characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classification, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

Engineering Index Properties

Table 14 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under the heading "Soil Series and Their Morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as about 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system *(2)* and the system adopted by the American Association of State Highway and Transportation Officials *(1)*.

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20, or higher, for the poorest.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates

determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index generally are rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

Physical and Chemical Properties

Table 15 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence the shrink-swell potential, permeability, plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at ⅓-bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems and septic tank absorption fields.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion. Losses are expressed in tons per acre per year. These estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.02 to 0.69. The higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity. The rate is expressed in tons per acre per year.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In table 15, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter in a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

Soil and Water Features

Table 16 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the infiltration of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep or very deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission. Crevasse soils are an example.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep to very deep, moderately well drained or well drained soils that have a moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission. Memphis soils are an example.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission. Loring soils are an example.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission. Openlake soils are an example.

Flooding, the temporary covering of the soil surface by flowing water, is caused by overflowing streams or by runoff from adjacent slopes. Shallow water standing or flowing for short periods after rainfall or snowmelt is not considered flooding. Standing water in swamps and marshes or in a closed depression is considered ponding.

Table 16 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, occasional, and frequent. *None* means that flooding is not probable. *Rare* means that flooding is unlikely but possible under unusual weather conditions (the chance of flooding is nearly 0 percent to 5 percent in any year). *Occasional* means that flooding occurs infrequently under normal weather conditions (the chance of flooding is 5 to 50 percent in any year). *Frequent* means that flooding occurs often under normal weather conditions (the chance of flooding is more than 50 percent in any year). Duration is expressed as *very brief* (less than 2 days), *brief* (2 to 7 days), *long* (7 days to 1 month), and *very long* (more than 1 month). The time of year that floods are most likely to occur is expressed in months. About two-thirds to three-fourths of all flooding occurs during the stated period.

The information on flooding is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and little or no horizon development.

Also considered is local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 16 are depth to the seasonal high water table; the

kind of water table, that is, *perched* or *apparent*; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 16.

An *apparent* water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. A *perched* water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Two numbers in the column showing depth to the water table indicate the normal range in depth to a saturated zone. Depth is given to the nearest half foot. The first numeral in the range indicates the highest water level. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. "More than 6.0" indicates that the water table is below a depth of 6 feet or that it is within a depth of 6 feet for less than a month.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low, moderate,* or *high,* is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low, moderate,* or *high.* It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Physical and Chemical Analyses of Selected Soils

The results of physical analysis of several typical pedons in the survey area are given in table 17 and the results of chemical analysis in table 18. The data are for soils sampled at carefully selected sites. The pedons are representative of the series described in the section "Soil Series and Their Morphology." Soil samples were analyzed by the Kentucky Agricultural Experiment Station, Lexington, Kentucky.

Most determinations, except those for grain-size analysis and bulk density, were made on soil material smaller than 2 millimeters in diameter. Measurements reported as percent or quantity of unit weight were calculated on an ovendry basis. The methods used in obtaining the data are indicated in the list that follows. The codes in parentheses refer to published methods *(26)*.

Coarse materials—(2-75 mm fraction) weight estimates of the percentages of all material less than 75 mm (3B1).
Sand—(0.05-2.0 mm fraction) weight percentages of material less than 2 mm (3A1).
Silt—(0.002-0.05 mm fraction) pipette extraction, weight percentages of all material less than 2 mm (3A1).
Clay—(fraction less than 0.002 mm) pipette extraction, weight percentages of material less than 2 mm (3A1).
Organic carbon—wet combustion. Walkley-Black modified acid-dichromate, ferric sulfate titration (6A1c).
Extractable cations—ammonium acetate pH 7.0, atomic absorption; calcium (6N2e), magnesium (6O2d), sodium (6P2b), potassium (6Q2b).
Extractable acidity—barium chloride-triethanolamine IV (6H5a).
Cation-exchange capacity—ammonium acetate, pH 7.0, steam distillation (5A8b).
Cation-exchange capacity—sum of cations (5A3a).
Base saturation—ammonium acetate, pH 7.0 (5C1).
Base saturation—sum of cations, TEA, pH 8.2 (5C3).
Reaction (pH)—1:1 water dilution (8C1f).
Reaction (pH)—potassium chloride (8C1g).
Aluminum—potassium chloride extraction (6G9).
Available phosphorus—procedure (656; Bray No. 1), Kentucky Agricultural Experiment Station.
Calcium carbonate equivalent—procedure (2366), USDA Handbook 60, USDA salinity laboratory 1954 (6N7).

Engineering Index Test Data

Table 19 shows laboratory test data for several pedons sampled at carefully selected sites in the survey area. The pedons are representative of the series described in the section "Soil Series and Their Morphology." The soil samples were tested by the Soil Mechanics Laboratory, Natural Resources Conservation Service, Fort Worth, Texas.

The testing methods generally are those of the American Association of State Highway and Transportation Officials (AASHTO) or the American Society for Testing and Materials (ASTM).

The tests and methods are AASHTO classification—M 145 (AASHTO), D 3282 (ASTM); Unified classification—D 2487 (ASTM); Mechanical analysis—T 88 (AASHTO), D 422 (ASTM), D 2217 (ASTM); Liquid limit—T 89 (AASHTO), D 4318 (ASTM); Plasticity index—T 90 (AASHTO), D 4318 (ASTM); Moisture density—T 99 (AASHTO), D 698 (ASTM); and Specific gravity—T 100 (AASHTO), D 854 (ASTM).

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories *(24)*. Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or on laboratory measurements. Table 20 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Eleven soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol.* An example is Entisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Aquent (*Aqu,* meaning water, plus *ent,* from Entisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Fluvaquents (*Fluv,* meaning flood plain, plus *aquent,* the suborder of the Entisols that has an aquic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Fluvaquents.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Generally, the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-silty, mixed, nonacid, thermic Typic Fluvaquents.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. There can be some variation in the texture of the surface layer or of the substratum. The Mhoon series is an example of a fine-silty, mixed, nonacid, thermic Typic Fluvaquent.

Soil Series and Their Morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The location of each pedon is indicated by a special symbol on the detailed soil maps. The detailed description of each soil horizon follows standards in the "Soil Survey Manual" *(27)*. Many of the technical terms used in the descriptions are defined in "Soil Taxonomy" *(24)*. Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed Soil Map Units."

Adler Series

The Adler series consists of very deep, moderately well drained, moderately permeable soils on flood plains. These soils formed in alluvium that washed from loessial soils on uplands. Slopes range from 0 to 2 percent. Adler soils are coarse-silty, mixed, nonacid, thermic Aquic Udifluvents.

Adler soils are commonly associated on the landscape with Convent and Mhoon soils on flood plains and with Center and Routon soils on stream terraces. Convent soils are somewhat poorly drained, and Mhoon soils are poorly drained. Center soils are moderately well drained or somewhat poorly drained, and Routon soils are poorly drained.

Typical pedon of Adler silt loam, frequently flooded; about 3.2 miles north of Clinton on Kentucky Highway 703; 650 feet south of the intersection of Kentucky Highway 703 and the Brush Creek bridge; about 150 feet east of Kentucky Highway 703, in Hickman County; on soil map sheet 20, east-west about 1,053,050 feet and north-south about 154,500 feet by the Kentucky coordinate grid system:

Ap1—0 to 5 inches; dark yellowish brown (10YR 4/4) silt loam; weak medium granular structure; friable; many fine and medium roots; neutral; clear smooth boundary.

Ap2—5 to 11 inches; dark yellowish brown (10YR 4/4) silt; common medium faint brown (10YR 5/3) mottles; weak medium subangular blocky structure; friable; many fine roots; neutral; clear smooth boundary.

C1—11 to 14 inches; brown (10YR 5/3) silt loam; common medium faint grayish brown (10YR 5/2) mottles; massive; firm; common fine roots; brittle in about 20 percent of the horizon; neutral; clear smooth boundary.

C2—14 to 27 inches; dark yellowish brown (10YR 4/4) silt; common medium distinct brown (10YR 5/3) and few fine faint grayish brown mottles; massive; friable; few fine roots; few medium distinct yellowish red (5YR 5/6) iron coatings; slightly acid; clear smooth boundary.

2Ab1—27 to 34 inches; dark brown (10YR 4/3) silt loam; common medium distinct dark grayish brown (10YR 4/2) and grayish brown (10YR 5/2) mottles; weak medium subangular blocky structure; friable; very few medium dark concretions; strongly acid; abrupt smooth boundary.

2Ab2—34 to 38 inches; very dark grayish brown (10YR 3/2) silt loam; weak and moderate fine subangular blocky structure; friable; very strongly acid; clear smooth boundary.

2Bwb—38 to 45 inches; dark brown (10YR 4/3) silt loam; few fine distinct very dark grayish brown (10YR 3/2) and common fine faint dark grayish brown (10YR 4/2) mottles; moderate fine and medium subangular blocky structure; friable; very few medium dark concretions; very strongly acid; clear smooth boundary.

2BCb—45 to 60 inches; grayish brown (10YR 5/2) and dark grayish brown (10YR 4/2) silt loam; common medium distinct dark brown (10YR 4/3) mottles; weak medium subangular blocky structure; friable; very few medium dark concretions; very strongly acid.

Reaction ranges from very strongly acid to mildly alkaline throughout the profile.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4.

The C horizon has hue of 10YR, value of 4 to 6, and chroma of 3 or 4. It has mottles in shades of brown or gray. It is silt, silt loam, or very fine sandy loam.

Some pedons have a Cg horizon. This horizon generally has hue of 10YR or 2.5Y, value of 5 to 7, and chroma of 1 or 2. In some pedons it is neutral in hue.

The 2Ab, 2Bwb, and 2BCb horizons have hue of 10YR, value of 3 to 6, and chroma of 2 to 4. They have mottles in shades of brown or gray. They are silt or silt loam.

Some pedons have a 2Cb horizon. This horizon has colors similar to those of the 2BCb horizon. It is silt, silt loam, or very fine sandy loam.

Bardwell Series

The Bardwell series consists of very deep, well drained, moderately permeable soils on flood plains. These soils formed in loamy alluvium. Slopes range from 0 to 2 percent. Bardwell soils are fine-silty, mixed, thermic Fluventic Hapludolls.

Bardwell soils are commonly associated on the landscape with Commerce, Keyespoint, Mhoon, Robinsonville, and Crevasse soils. Commerce and Keyespoint soils are somewhat poorly drained, and Mhoon soils are poorly drained. Robinsonville and Crevasse soils are more sandy throughout than the Bardwell soils.

Typical pedon of Bardwell silt loam, frequently flooded; about 5.8 miles northeast of Bardwell; about 2.9 miles east of the intersection of Kentucky Highway 1203 and United States Highway 51; about 5,000 feet south of the south side of Westvaco's waste disposal lake; about 1,300 feet east of the bank of the Mississippi River, in Carlisle County; on soil map sheet 1, east-west about 1,021,800 feet and north-south

about 231,900 feet by the Kentucky coordinate grid system:

Ap—0 to 9 inches; dark brown (10YR 3/3) silt loam, brown (10YR 5/3) dry; weak fine granular structure; friable; many fine and medium roots; mildly alkaline; clear smooth boundary.

A—9 to 17 inches; dark brown (10YR 3/3) silty clay loam, brown (10YR 3/3) dry; weak and moderate medium subangular blocky structure parting to weak fine granular; friable; many fine roots; mildly alkaline; gradual smooth boundary.

Bw1—17 to 30 inches; brown (10YR 4/3) silty clay loam; weak and moderate medium subangular blocky structure; friable; few fine roots; few dark grayish brown (10YR 4/2) and dark brown (10YR 3/3) coatings on peds; mildly alkaline; clear smooth boundary.

Bw2—30 to 49 inches; brown (10YR 4/3) silty clay loam; weak thick platy and weak coarse subangular blocky structure parting to weak and moderate medium subangular blocky; firm; laminated with dark grayish brown (2.5Y 4/2) silty clay loam 2 to 3 inches thick; mildly alkaline; gradual smooth boundary.

BC—49 to 60 inches; yellowish brown (10YR 5/4) silt loam; many fine and many medium faint dark grayish brown (10YR 4/2) mottles; weak coarse subangular blocky structure; few dark reddish brown (5YR 3/4) organic stains; mildly alkaline.

The thickness of the solum ranges from 40 to 60 inches. Reaction ranges from medium acid to mildly alkaline throughout the profile. The content of rock fragments ranges from 0 to 35 percent in the BC horizon.

The Ap and A horizons have hue of 10YR, value of 2 or 3, and chroma of 1 to 3.

The Bw horizon has hue of 10YR. It has value of 4 and chroma of 2 or has value of 4 or 5 and chroma of 3 or 4. It is silt loam or silty clay loam.

The BC horizon and the C horizon, if it occurs, have colors similar to those of the Bw horizon. In the fine-earth fraction, they are silt loam, fine sandy loam, loam, fine sand, silty clay loam, or sandy clay loam.

Bowdre Series

The Bowdre series consists of very deep, somewhat poorly drained soils on flood plains. These soils formed in layered alluvium along the Mississippi River. Permeability is slow in the upper clayey layers and moderate in the lower loamy layers. Slopes range from 0 to 2 percent. Bowdre soils are clayey over loamy, montmorillonitic, thermic Fluvaquentic Hapludolls.

Bowdre soils are associated on the landscape with Keyespoint, Robinsonville, Crevasse, Commerce, and Mhoon soils. Keyespoint soils are 20 to 40 inches deep to a loamy horizon, Robinsonville soils are in a coarse-loamy family, and Crevasse soils are in a sandy family. Commerce and Mhoon soils are in fine-silty families.

Typical pedon of Bowdre silty clay loam, in an area of Bowdre-Robinsonville complex, frequently flooded; about 10.5 miles northwest of Clinton on Wolf Island; about 1.6 miles southwest of the intersection of River Road and Wolf Island Road; about 3,000 feet east of Wolf Island Road; about 100 feet east of an unnamed gravel road, in Hickman County; on soil map sheet 18, east-west about 998,650 feet and north-south about 164,650 feet by the Kentucky coordinate grid system:

Ap—0 to 4 inches; very dark grayish brown (10YR 3/2) silty clay loam; common fine faint very dark gray (10YR 3/1) and dark gray (10YR 4/1) mottles; weak medium granular structure; firm; many fine roots; neutral; abrupt smooth boundary.

Bw1—4 to 12 inches; very dark grayish brown (10YR 3/2) silty clay; common fine faint very dark gray (10YR 3/1) and dark gray (10YR 4/1) mottles; moderate medium subangular blocky structure; very firm; many fine roots; neutral; clear smooth boundary.

Bw2—12 to 16 inches; very dark grayish brown (10YR 3/2) silty clay loam; common fine faint very dark gray (10YR 3/1) and dark gray (10YR 4/1) mottles; weak and moderate medium subangular blocky structure; firm; many fine roots; neutral; gradual smooth boundary.

2C1—16 to 30 inches; mixed yellowish brown (10YR 5/4) and brown (10YR 5/3) fine sandy loam; few fine faint grayish brown mottles; massive; very friable; few fine roots; stratified with loamy fine sand; slightly acid; gradual smooth boundary.

2C2—30 to 60 inches; brown (10YR 5/3) silt loam; common fine faint grayish brown (10YR 5/2) mottles; massive; very friable; stratified with very fine sandy loam and loam; neutral.

Depth to the 2C horizon ranges from 12 to 20 inches. Reaction ranges from medium acid to neutral in the A horizon and from slightly acid to moderately alkaline in the B and 2C horizons.

The Ap and Bw horizons have hue of 10YR, value of 2 or 3, and chroma of 1 to 3. They have mottles in shades of brown or gray. The Bw horizon is silty clay or silty clay loam.

The 2C horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 1 to 4. It has mottles in shades of gray or brown. It is silt loam, loam, sandy loam, fine sandy loam, or very fine sandy loam.

Calloway Series

The Calloway series consists of very deep, somewhat poorly drained, slowly permeable soils on broad upland ridges and stream terraces. These soils formed in loess. Slopes range from 0 to 3 percent. Calloway soils are fine-silty, mixed, thermic Glossaquic Fragiudalfs.

Calloway soils are associated on the landscape with Loring soils on ridges in the uplands and with Center and Routon soils on low stream terraces. Loring soils are moderately well drained. Center and Routon soils have an argillic horizon without a fragipan.

Typical pedon of Calloway silt loam, 0 to 3 percent slopes (fig. 15); about 6 miles northeast of Clinton; 1.3 miles north of the intersection of Kentucky Highways 703 and 288; 400 feet east of Kentucky Highway 288; 150 feet north of Byars Road, in Hickman County; on soil map sheet 20, east-west about 1,072,450 feet and north-south about 158,550 feet by the Kentucky coordinate grid system:

Ap—0 to 8 inches; dark brown (10YR 4/3) silt loam; few fine faint brown and grayish brown mottles; weak medium platy and weak fine granular structure; friable; common fine roots; few dark concretions; very strongly acid; abrupt smooth boundary.

Bw—8 to 13 inches; yellowish brown (10YR 5/4) silt loam; common medium distinct light yellowish brown (10YR 6/4) and few fine faint light brownish gray (10YR 6/2) mottles; weak coarse subangular blocky structure; friable; few fine roots; few fine rounded dark concretions; very strongly acid; clear smooth boundary.

E—13 to 19 inches; pale brown (10YR 6/3) silt loam; many medium distinct light brownish gray (10YR 6/2) mottles; weak thick platy and weak medium subangular blocky structure; friable; brittle in about 20 percent of the horizon; few fine roots; common silt coatings on faces of peds; common fine rounded dark concretions; very strongly acid; clear wavy boundary.

Btx1—19 to 32 inches; light brownish gray (10YR 5/2) and yellowish brown (10YR 5/6) silty clay loam; common medium distinct light yellowish brown (10YR 6/4) mottles; strong coarse prismatic structure parting to moderate medium subangular blocky; firm, compact, and brittle; few fine roots along streaks between prisms; few fine patchy clay films on faces of peds; common silt coatings between prisms; common fine and medium rounded dark concretions; very strongly acid; gradual wavy boundary.

Btx2—32 to 48 inches; yellowish brown (10YR 5/6) silt loam; common medium distinct pale brown (10YR 6/3) and many coarse distinct light brownish gray (10YR 6/2) mottles; moderate very coarse prismatic structure parting to moderate medium subangular blocky; firm, compact, and brittle; very few roots along streaks between prisms; few fine patchy clay films on faces of peds; common distinct silt coatings between prisms; common medium rounded dark concretions; strongly acid; gradual wavy boundary.

Btx3—48 to 60 inches; yellowish brown (10YR 5/6) silt loam; many coarse distinct light brownish gray (10YR 6/2) and common medium distinct light yellowish brown (10YR 6/4) mottles; weak very coarse prismatic structure parting to weak and moderate medium subangular blocky; firm, compact, and brittle; very few roots along streaks between prisms; few fine patchy clay films on faces of peds; common distinct silt coatings between prisms; common coarse and many medium rounded dark concretions; strongly acid.

The solum is more than 60 inches thick. Depth to the fragipan ranges from 14 to 38 inches. Reaction ranges from medium acid to very strongly acid in the upper part of the solum and from strongly acid to mildly alkaline in the lower part.

The Ap horizon has hue of 10YR, value of 4 to 6, and chroma of 2 to 4.

The Bw horizon has hue of 10YR or 2.5Y and value and chroma of 4 to 6. It has mottles in shades of gray or brown.

The E horizon has hue of 10YR, value of 5 to 7, and chroma of 1 to 3. It is silt or silt loam.

The Btx horizon has hue of 10YR or 2.5Y, value of 5, and chroma of 2 to 6. It is silt loam or silty clay loam.

Center Series

The Center series consists of very deep, moderately well drained or somewhat poorly drained soils that are moderately slowly permeable. These soils formed in loess on low stream terraces. Slopes range from 0 to 3 percent. Center soils are fine-silty, mixed, thermic Aquic Hapludalfs.

Center soils are commonly associated on the landscape with Routon and Calloway soils and with Adler, Convent, and Mhoon soils on flood plains. Routon soils are poorly drained. Calloway soils have a slowly permeable fragipan. Adler soils are moderately well drained, Convent soils are somewhat poorly drained, and Mhoon soils are poorly drained.

Typical pedon of Center silt loam, 0 to 3 percent slopes, rarely flooded; about 4.7 miles southwest of

Clinton; about 850 feet south of the intersection of Whaynes Corner Road and Whaynes Road; about 50 feet east of Whaynes Road, in Hickman County; on soil map sheet 25, east-west about 1,024,350 feet and north-south about 131,200 feet by the Kentucky coordinate grid system:

Ap—0 to 6 inches; dark brown (10YR 4/3) silt loam; common medium faint dark grayish brown (10YR 4/2) mottles; weak medium granular structure; friable; many fine roots; slightly acid; clear smooth boundary.

Bt—6 to 21 inches; yellowish brown (10YR 5/4) silty clay loam; common fine faint brown (10YR 5/3) and few fine distinct grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure parting to moderate fine subangular blocky; firm; many fine roots; few clay films on faces of peds; few dark concretions; slightly acid; clear smooth boundary.

Btg—21 to 37 inches; light brownish gray (2.5Y 6/2) silty clay loam; common medium distinct brown (10YR 5/3) and yellowish brown (10YR 5/4) mottles; moderate medium subangular blocky structure parting to weak fine subangular blocky; firm; common fine roots; few clay films on faces of peds; few dark concretions; slightly acid; gradual smooth boundary.

BC—37 to 50 inches; mixed yellowish brown (10YR 5/6), brown (10YR 5/3), and grayish brown (2.5Y 5/2) silt loam; weak medium subangular blocky structure; firm; very few dark concretions; mildly alkaline; gradual smooth boundary.

C—50 to 60 inches; mixed yellowish brown (10YR 5/6), brown (10YR 5/3), and grayish brown (2.5Y 5/2) silt loam; massive; friable; very few dark concretions; mildly alkaline.

The thickness of the solum ranges from 30 to 60 inches. Reaction ranges from slightly acid to strongly acid in the upper horizons and from medium acid to mildly alkaline in the BC and C horizons.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4.

The Bt horizon has hue of 10YR or 2.5Y and value and chroma of 4 to 6. It has mottles in shades of gray or brown. It is silt loam or silty clay loam.

The Btg horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 2 or less.

The BC and C horizons have hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2 to 6. They have mottles in shades of gray or brown. They are silt loam or silty clay loam.

Commerce Series

The Commerce series consists of very deep, somewhat poorly drained soils that are moderately slowly permeable. These soils formed in loamy alluvium on the flood plains along the Mississippi River. Slopes range from 0 to 2 percent. Commerce soils are fine-silty, mixed, nonacid, thermic Aeric Fluvaquents.

Commerce soils are associated on the landscape with Mhoon, Openlake, Bardwell, and Crevasse soils. Mhoon soils are poorly drained. Bardwell soils are well drained. Openlake soils are more clayey than the Commerce soils, and Crevasse soils are more sandy.

Typical pedon of Commerce silt loam, frequently flooded; about 9.7 miles west of Clinton on Wolf Island; about 2.6 miles south of the intersection of Wolf Island Road and River Road; about 300 feet west of the bank of the Mississippi River, in Hickman County; on soil map sheet 18, east-west about 999,050 feet and north-south about 156,300 feet by the Kentucky coordinate grid system:

Ap—0 to 5 inches; dark grayish brown (10YR 4/2) silt loam; weak medium granular and subangular blocky structure; friable; few fine roots; mildly alkaline; abrupt smooth boundary.

Bw—5 to 12 inches; dark grayish brown (2.5Y 4/2) silt loam; common medium faint brown (10YR 5/3) mottles; weak coarse subangular blocky structure; friable; bedding planes; few fine roots; mildly alkaline; clear smooth boundary.

Bg1—12 to 25 inches; dark gray (10YR 4/1) silty clay loam; common medium faint dark grayish brown (10YR 4/2) and few medium distinct brown (10YR 5/3) mottles; moderate coarse subangular blocky structure parting to weak medium subangular blocky; firm; bedding planes; few fine roots; mildly alkaline; clear smooth boundary.

Bg2—25 to 30 inches; dark gray (10YR 4/1) silt loam; common medium distinct brown (10YR 5/3) and common medium faint dark grayish brown (10YR 4/2 and 2.5Y 4/2) mottles; moderate medium subangular blocky structure; friable; bedding planes; few fine roots; neutral; clear smooth boundary.

Cg—30 to 48 inches; dark gray (10YR 4/1) silty clay loam; common fine faint dark grayish brown (2.5Y 4/2) and brown (10YR 5/3) mottles; massive; firm; bedding planes; mildly alkaline; gradual smooth boundary.

C—48 to 60 inches; dark grayish brown (2.5Y 4/2) silty clay loam; many medium faint dark gray (10YR 4/1) mottles; massive; firm; mildly alkaline.

The thickness of the solum ranges from 20 to 45 inches. Reaction ranges from slightly acid to mildly

alkaline in the solum and from neutral to moderately alkaline in the substratum.

The Ap horizon has hue of 10YR, value of 3 to 5, and chroma of 2 or 3.

The Bw horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2.

The Bg horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of less than 2. It has mottles in shades of brown or gray. It is silt loam or silty clay loam.

The Cg and C horizons have hue of 10YR or 2.5Y, value of 4 or 5, and chroma of less than 2. They have mottles in shades of brown or gray. They are dominantly very fine sandy loam, silt loam, loam, or silty clay loam. In some pedons, however, the C horizon has thin strata of silty clay.

Convent Series

The Convent series consists of very deep, somewhat poorly drained, moderately permeable soils on flood plains. These soils formed in loamy alluvium. Slopes range from 0 to 2 percent. Convent soils are coarse-silty, mixed, nonacid, thermic Aeric Fluvaquents.

Convent soils are commonly associated on the landscape with Adler and Mhoon soils and with Center and Routon soils on stream terraces. Adler soils are moderately well drained, and Mhoon soils are poorly drained. Center soils are moderately well drained or somewhat poorly drained, and Routon soils are poorly drained.

Typical pedon of Convent silt loam, in an area of Convent-Adler silt loams, frequently flooded; about 7.6 miles northeast of Clinton; about 1.6 miles north of Old Cypress; about 500 feet northeast of the end of Claudie Bugg Road, in Hickman County; on soil map sheet 20, east-west about 1,077,500 feet and north-south about 167,350 feet by the Kentucky coordinate grid system:

Ap—0 to 10 inches; dark brown (10YR 4/3) silt loam; common medium distinct brown (10YR 5/3) and grayish brown (10YR 5/2) mottles; weak medium granular structure; friable; common fine roots; medium acid; clear smooth boundary.

A—10 to 18 inches; dark brown (10YR 4/3) silt loam; many medium distinct grayish brown (10YR 5/2) and brown (10YR 5/3) mottles; weak medium subangular blocky structure parting to weak and moderate medium granular; friable; common fine roots; neutral; clear smooth boundary.

Bw—18 to 24 inches; grayish brown (10YR 5/2) silt loam; many medium distinct dark brown (10YR 4/3) and common medium faint brown (10YR 5/3) mottles; weak medium subangular blocky structure; friable; few fine roots; neutral; clear smooth boundary.

2Bgb1—24 to 32 inches; light brownish gray (10YR 6/2) silt loam; many medium distinct light yellowish brown (2.5Y 6/4), few medium distinct brownish yellow (10YR 6/6), and few medium faint brown (10YR 5/3) mottles; weak medium subangular blocky structure; friable; few fine roots; very few fine dark concretions; neutral; gradual smooth boundary.

2Bgb2—32 to 60 inches; light brownish gray (10YR 6/2) silt loam; common medium faint brown (10YR 5/3) and yellowish brown (10YR 5/4) mottles; weak medium subangular blocky structure; firm; slightly brittle in about 40 percent of the horizon; few dark concretions; neutral.

Reaction ranges from medium acid to moderately alkaline throughout the profile.

The Ap and A horizons have hue of 10YR, value of 4 or 5, and chroma of 2 or 3. In some pedons they have mottles in shades of brown or gray.

The Bw horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 to 4. Chroma is 3 or 4 in as much as 40 percent of the 10- to 40-inch control section. This horizon has mottles in shades of brown or gray. It is silt loam or silt.

The 2Bgb horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2 or less. It has mottles in shades of gray or brown. It is dominantly is silt loam or silt, but some pedons have a thin horizon of silty clay loam, loam, or fine sandy loam.

Some pedons have a C horizon. This horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 or less. It has mottles in shades of gray or brown. It is silt loam, loam, or fine sandy loam.

Crevasse Series

The Crevasse series consists of very deep, excessively drained, rapidly permeable soils on flood plains along the Mississippi River. These soils formed in sandy alluvium. Slopes range from 0 to 2 percent. Crevasse soils are mixed, thermic Typic Udipsamments.

Crevasse soils are associated on the landscape with Commerce, Bardwell, and Robinsonville soils. Commerce and Bardwell soils are in fine-silty families, and Robinsonville soils are in a coarse-loamy family.

Typical pedon of Crevasse sand, frequently flooded; about 8 miles west of Clinton; about 4,000 feet northwest of the intersection of Whaynes Corner Road and Hickman Road; about 1,200 feet south of Old Obion Bottom Road, in Hickman County; on soil map sheet 21, east-west about 1,006,700 feet and north-

south about 135,050 feet by the Kentucky coordinate grid system:

A—0 to 13 inches; brown (10YR 5/3) and grayish brown (2.5Y 5/2) sand; single grained; very friable; few fine roots; bedding planes; neutral; clear smooth boundary.
C1—13 to 17 inches; grayish brown (2.5Y 5/2) and yellowish brown (10YR 5/4) sand; single grained; very friable; few fine roots; bedding planes; common fragments of partially decomposed organic matter; neutral; gradual smooth boundary.
C2—17 to 40 inches; grayish brown (2.5Y 5/2) and yellowish brown (10YR 5/4) fine sand; single grained; loose; bedding planes; neutral; diffuse smooth boundary.
C3—40 to 60 inches; grayish brown (2.5Y 5/2) fine sand; common medium distinct light olive brown (2.5Y 5/4) mottles; single grained; loose; bedding planes; neutral.

Reaction ranges from medium acid to moderately alkaline throughout the profile.

The A horizon has hue of 10YR, value of 4 to 7, and chroma of 2 to 6.

The C horizon has hue of 10YR, value of 4 to 6, and chroma of 2 to 6 or has hue of 2.5Y, value of 4 or 5, and chroma of 2. It is sand, fine sand, loamy fine sand, or loamy sand.

Dekoven Series

The Dekoven series consists of very deep, very poorly drained, moderately permeable soils on flood plains. These soils formed in silty alluvium. Slopes range from 0 to 2 percent. Dekoven soils are fine-silty, mixed, thermic Fluvaquentic Haplaquolls.

Dekoven soils are commonly associated on the landscape with Convent and Mhoon soils on flood plains and with Calloway, Center, and Routon soils on stream terraces. Convent and Mhoon soils do not have a mollic epipedon. Convent soils are somewhat poorly drained, and Mhoon soils are poorly drained. Calloway soils have a slowly permeable fragipan. Center and Routon soils have an argillic horizon and do not have a mollic epipedon.

Typical pedon of Dekoven silt loam, overwash, occasionally flooded; about 5.8 miles west of Clinton; about 1.1 miles northeast of Hailwell; about 1,500 feet northeast of the intersection of Kentucky Highway 123 and Able Creek, in Hickman County; on soil map sheet 22, east-west about 1,019,500 feet and north-south about 146,700 feet by the Kentucky coordinate grid system:

Ap—0 to 10 inches; dark brown (10YR 4/3) silt loam; common medium faint dark grayish brown (10YR 4/2) mottles; weak medium granular structure; friable; many fine roots; neutral; clear smooth boundary.
A—10 to 14 inches; dark brown (10YR 4/3) silt loam; weak medium subangular blocky structure; friable; many fine roots; mildly alkaline; clear smooth boundary.
Ab—14 to 26 inches; very dark gray (10YR 3/1) silt loam; common medium faint dark gray (10YR 4/1) and common fine faint dark yellowish brown (10YR 4/4) mottles; moderate medium subangular blocky structure; firm; common fine roots; mildly alkaline; gradual smooth boundary.
Bgb1—26 to 44 inches; dark gray (10YR 4/1) silty clay loam; common fine distinct olive brown (2.5Y 4/4) mottles; moderate coarse subangular blocky structure parting to weak and moderate medium subangular blocky; firm; few fine roots; mildly alkaline; gradual smooth boundary.
Bgb2—44 to 60 inches; dark gray (10YR 4/1) silty clay loam; many medium distinct yellowish brown (10YR 5/6) and common medium faint brownish yellow (10YR 6/6) mottles; weak medium subangular blocky structure; firm; mildly alkaline.

The solum is more than 48 inches thick. Reaction ranges from slightly acid to mildly alkaline throughout the profile.

The Ap and A horizons have hue of 10YR, value of 4, and chroma of 3 or 4. The A horizon is silt loam or silty clay loam.

The Ab horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. It is silt loam or silty clay loam.

The Bgb horizon and the BCb horizon, if it occurs, have hue of 10YR, 2.5Y, or 5Y, value of 3 to 6, and chroma of 1 or 2. They have mottles in shades of olive, brown, or gray. They are silt loam or silty clay loam.

Iuka Series

The Iuka series consists of very deep, moderately well drained, moderately permeable soils on flood plains. These soils formed in loamy and sandy alluvium. Slopes range from 0 to 2 percent. Iuka soils are coarse-loamy, siliceous, acid, thermic Aquic Udifluvents.

Iuka soils are commonly associated on the landscape with Adler, Convent, and Mhoon soils. Adler and Convent soils are in coarse-silty families, and Mhoon soils are in a fine-silty family.

Typical pedon of Iuka sandy loam, occasionally flooded; about 9.3 miles northeast of Clinton; 1.2 miles east-southeast of the intersection of Kentucky Highway

307 and the dredged channel of Obion Creek; about 1,100 feet southwest of the south end of the nearest maintained gravel road, in Hickman County; on soil map sheet 17, east-west about 1,092,100 feet and north-south about 159,900 feet by the Kentucky coordinate grid system:

A—0 to 4 inches; dark grayish brown (10YR 4/2) sandy loam; moderate medium granular structure; friable; many fine roots; very strongly acid; clear smooth boundary.

C1—4 to 11 inches; brownish yellow (10YR 6/6) and yellowish brown (10YR 5/4) loamy sand; massive; very friable; few fine roots; about 5 percent gravel; strongly acid; clear smooth boundary.

C2—11 to 20 inches; brownish yellow (10YR 6/6) gravelly loamy sand; massive; very friable; few fine roots; about 15 percent gravel; strongly acid; clear smooth boundary.

C3—20 to 31 inches; brown (10YR 5/3) silt loam; stratified with sandy loam; common medium distinct grayish brown (10YR 5/2) and dark yellowish brown (10YR 4/4) mottles; massive; friable; about 5 percent gravel; strongly acid; clear smooth boundary.

C4—31 to 60 inches; brown (10YR 5/3) silt loam; common medium distinct dark yellowish brown (10YR 4/4) and grayish brown (10YR 5/2) mottles; massive; friable; common medium and fine brown concretions; strongly acid.

Reaction is strongly acid or very strongly acid throughout the profile unless the surface layer has been limed. The content of gravel ranges from 0 to 15 percent in the A horizon and from 0 to 20 percent in the C horizon.

The A horizon has hue of 10YR or 7.5YR, value of 3 to 6, and chroma of 2 to 4.

The C horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 3 to 6. It has mottles in shades of gray or brown. In the fine-earth fraction, it is sandy loam, loam, silt loam, fine sandy loam, or loamy sand.

Keyespoint Series

The Keyespoint series consists of very deep, somewhat poorly drained soils that formed in alluvium on flood plains along the Mississippi River. Permeability is very slow in the upper clayey layers and moderately rapid in the lower loamy layers. Slopes range from 0 to 2 percent. Keyespoint soils are clayey over loamy, montmorillonitic, nonacid, thermic Vertic Haplaquepts.

Keyespoint soils are commonly associated on the landscape with Bowdre, Bardwell, Openlake, Commerce, and Mhoon soils. Bowdre soils are 12 to 20 inches deep to a loamy horizon. Openlake soils are more clayey than the Keyespoint soils. Bardwell, Commerce, and Mhoon soils are silty throughout.

Typical pedon of Keyespoint silty clay loam (fig. 16), in an area of Keyespoint and Bardwell soils, frequently flooded; about 9.6 miles southwest of Bardwell on Island Nos. 2, 3, and 4, in Carlisle County; about 2,900 feet northeast of the intersection of the Missouri and Kentucky State line and an access road to the island; about 60 feet east of an unnamed dirt road; on soil map sheet 10, east-west about 998,600 feet and north-south about 194,950 feet by the Kentucky coordinate grid system:

Ap—0 to 6 inches; very dark grayish brown (10YR 3/2) silty clay loam; common fine faint dark gray (10YR 4/1) and very dark gray (10YR 3/1) mottles; weak fine granular structure; firm; few fine roots; neutral; clear smooth boundary.

Bg1—6 to 19 inches; dark grayish brown (10YR 4/2) silty clay; common medium faint dark brown (10YR 4/3), dark gray (10YR 4/1), and very dark gray (10YR 3/1) mottles; weak medium prismatic structure parting to moderate medium subangular and angular blocky; firm; few fine roots; shiny faces on some peds; few slickensides; neutral; clear smooth boundary.

Bg2—19 to 28 inches; dark grayish brown (10YR 4/2) silty clay loam; many medium distinct dark gray (10YR 4/1) and many coarse distinct dark brown (10YR 4/3) and brown (10YR 5/3) mottles; moderate medium angular and subangular blocky structure; firm; few fine roots; shiny faces on many peds; few slickensides; neutral; clear smooth boundary.

2C1—28 to 42 inches; brown (10YR 5/3) loamy sand; common medium distinct light yellowish brown (10YR 6/4) mottles; friable; few distinct bedding planes; very few very dark grayish brown (10YR 3/2) coatings in pores and root channels; mildly alkaline; gradual smooth boundary.

2C2—42 to 60 inches; grayish brown (10YR 5/2) very fine sandy loam; many medium faint brown (10YR 5/3) mottles; friable; few distinct bedding planes; mildly alkaline.

Depth to the 2C horizon ranges from 24 to 40 inches. Reaction ranges from medium acid to mildly alkaline in the Ap and Bg horizons and from medium acid to moderately alkaline in the 2C horizon.

The Ap horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3.

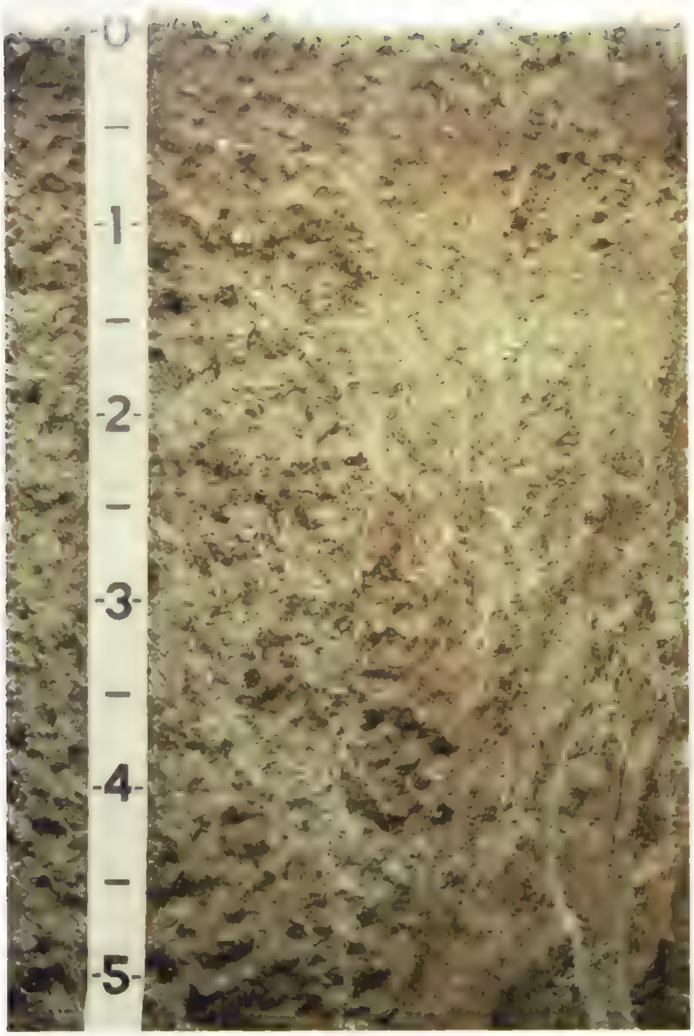

Figure 15.—Profile of Calloway silt loam.

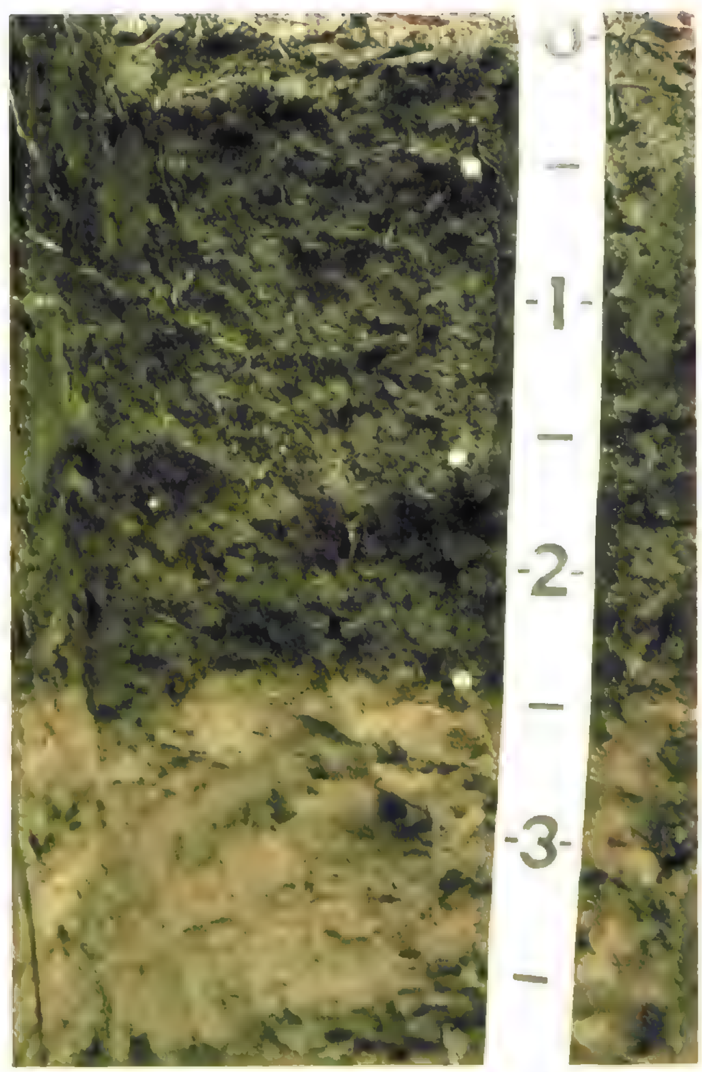

Figure 16.—Profile of Keyespoint silty clay loam.

Figure 17.—Profile of Loring silt loam.

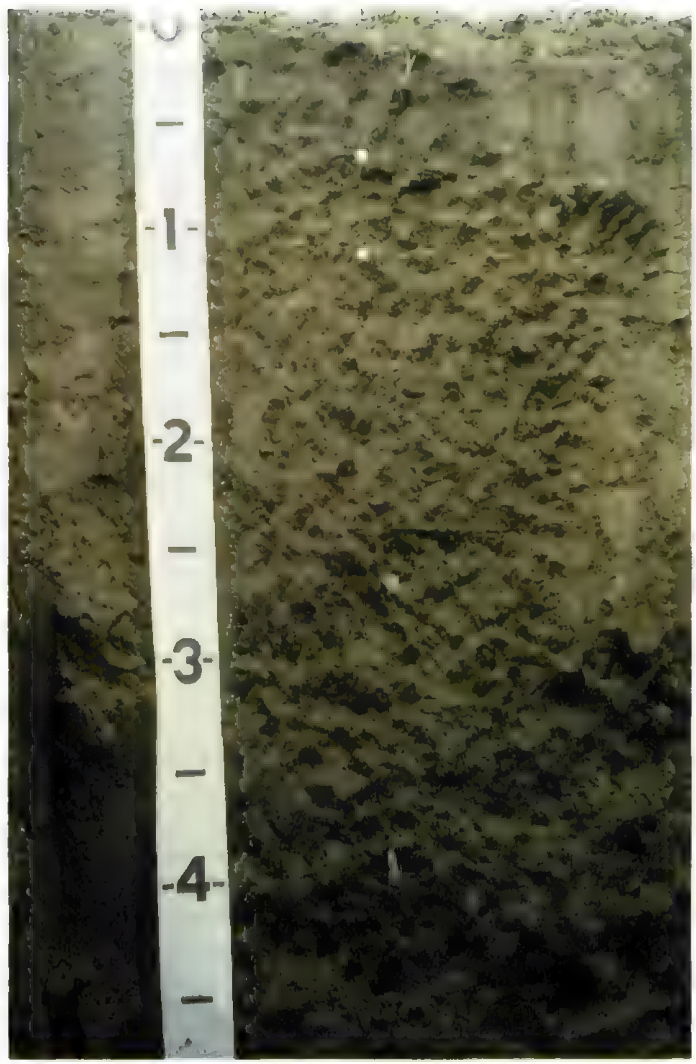

Figure 18.—Profile of Memphis silt loam.

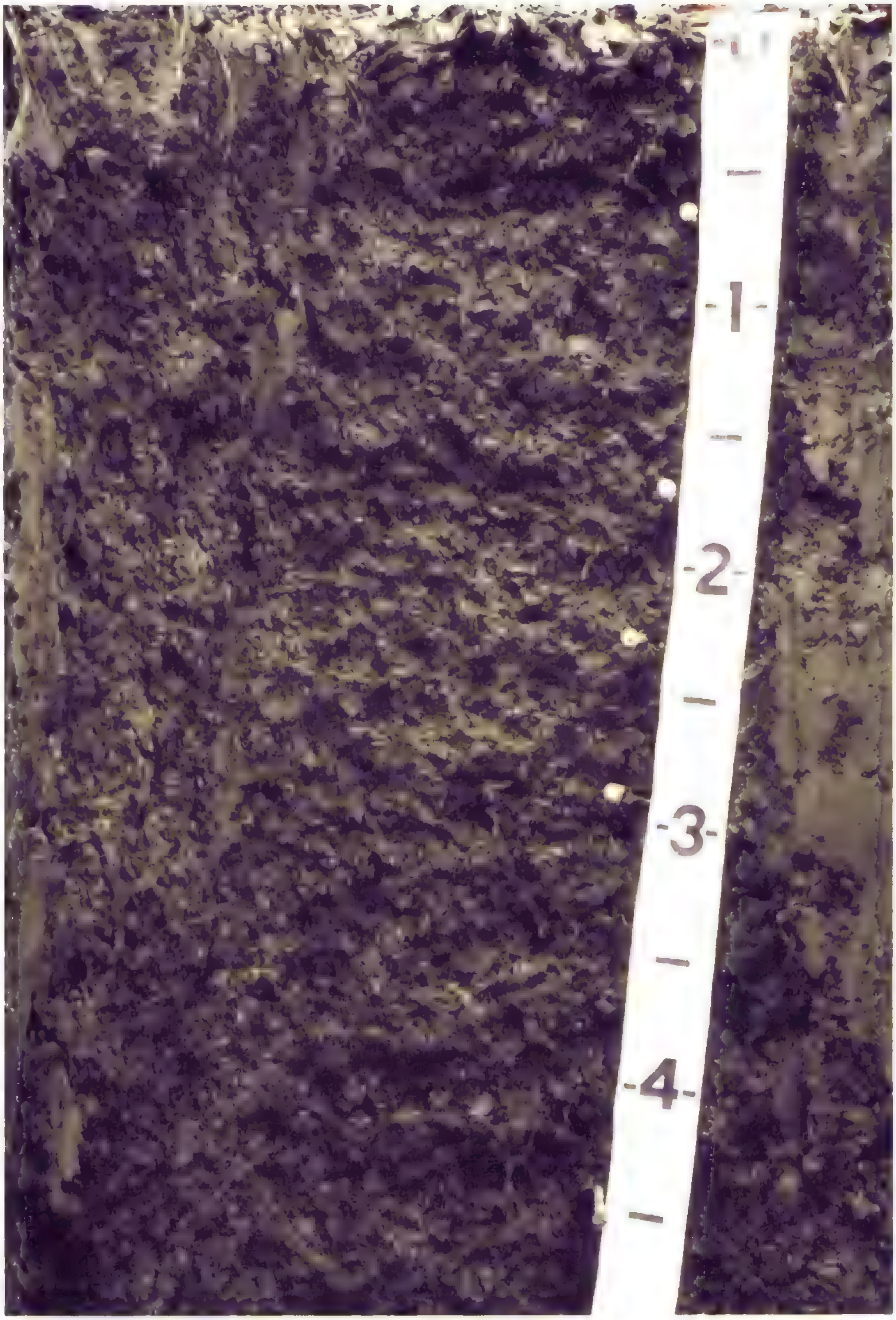

Figure 19.—Profile of Openlake silty clay.

Figure 20.—Profile of Saffell very gravelly loam.

The Bg horizon has hue of 10YR and value of 4 or 5. It generally has chroma of 2, but in some pedons it has chroma of 3 within a depth of 20 inches. This horizon has mottles in shades of gray or brown. It is silty clay or silty clay loam.

The 2C horizon has hue of 10YR, value of 4 to 6, and chroma of 2 or 3. It has mottles in shades of gray or brown. It is silt loam, loam, very fine sandy loam, fine sandy loam, sandy loam, loamy fine sand, loamy sand, sandy clay loam, clay loam, or silty clay loam.

Loring Series

The Loring series consists of very deep, moderately well drained soils that formed in loess on upland ridgetops and side slopes and on terraces. These soils have a fragipan. Permeability is moderate above the fragipan and moderately slow in the fragipan. Slopes range from 2 to 20 percent. Loring soils are fine-silty, mixed, thermic Typic Fragiudalfs.

Loring soils are associated on the landscape with Memphis, Calloway, and Saffell soils. Memphis soils are well drained, and Calloway soils are somewhat poorly drained. Saffell soils formed in loamy and gravelly coastal plain material without a mantle of loess.

Typical pedon of Loring silt loam, 2 to 6 percent slopes (fig. 17); about 7.6 miles northwest of Clinton; about 1.7 miles south of Columbus on Kentucky Highway 123; about 150 feet west of Kentucky Highway 123, in Hickman County; on soil map sheet 19, east-west about 1,018,200 feet and north-south about 164,800 feet by the Kentucky coordinate grid system:

Ap—0 to 8 inches; dark brown (10YR 4/3) silt loam; weak medium subangular blocky structure parting to weak fine granular; very friable; many fine roots; medium acid; abrupt smooth boundary.

Bt1—8 to 22 inches; yellowish brown (10YR 5/4) silt loam; weak and moderate medium subangular blocky structure; friable; common fine roots; few clay films on faces of peds; few distinct silt coatings on faces of peds; few fine dark concretions; medium acid; clear wavy boundary.

Bt2—22 to 27 inches; yellowish brown (10YR 5/6) silt loam; common medium distinct pale brown (10YR 6/3) mottles; moderate medium subangular and angular blocky structure; friable; few fine roots; common distinct silt coatings on faces of peds; few fine rounded dark concretions; medium acid; clear wavy boundary.

Btx1—27 to 37 inches; strong brown (7.5YR 5/6) silt loam; many medium distinct pale brown (10YR 6/3) and light brownish gray (10YR 6/2) mottles; moderate very coarse prismatic structure parting to moderate medium subangular blocky; firm, compact, and brittle; very few fine roots along streaks between prisms; few clay films on faces of peds within prisms; few distinct silt coatings between prisms; common medium rounded dark concretions; very strongly acid; gradual wavy boundary.

Btx2—37 to 60 inches; dark brown (7.5YR 4/4) silt loam; common medium distinct light brownish gray (10YR 6/2) and pale brown (10YR 6/3) mottles; weak very coarse prismatic structure; firm, compact, and brittle; very few fine roots along streaks between prisms; few fine clay films on faces of peds within prisms; few distinct silt coatings between prisms; common fine rounded dark concretions; very strongly acid.

The thickness of the solum ranges from 45 to 80 inches. Depth to the fragipan ranges from 14 to 35 inches. Reaction ranges from medium acid to very strongly acid throughout the profile unless the surface layer has been limed.

The Ap horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 2 to 6.

The Bt and Btx horizons have hue of 10YR or 7.5YR, value of 4 or 5, and chroma 4 to 6. They have mottles in shades of gray or brown. They are silt loam or silty clay loam.

Some pedons have a C horizon. This horizon has colors similar to those of the B horizon. It is silt loam.

Memphis Series

The Memphis series consists of very deep, well drained, moderately permeable soils on narrow to broad ridgetops in the uplands. These soils formed in loess. Slopes range from 2 to 40 percent.

Memphis soils are fine-silty, mixed, thermic Typic Hapludalfs. The Memphis soils in this survey area are taxadjuncts because their base saturation is lower than is defined as the range for the series. The soils are classified as Ultic Hapludalfs. This difference does not significantly affect the use, management, or behavioral characteristics of the soils.

Memphis soils are associated on the landscape with Loring, Molena, and Saffell soils. Loring soils have a slowly permeable fragipan. Molena soils formed in sandy coastal plain sediments. Saffell soils formed in loamy and gravelly coastal plain material without a mantle of loess.

Typical pedon of Memphis silt loam, 2 to 6 percent slopes (fig. 18); about 4.5 miles north of Clinton; about 1,500 feet southwest of the intersection of Spring Hill Road and Kentucky Highway 288, in Hickman County; on soil map sheet 20, east-west about 1,054,650 feet and north-south about 161,400 feet by the Kentucky coordinate grid system:

Ap—0 to 9 inches; dark brown (10YR 4/3) silt loam; weak medium subangular blocky structure parting to weak medium granular; friable; common fine roots; neutral; abrupt smooth boundary.

Bt1—9 to 14 inches; brown (7.5YR 5/4) silt loam; weak medium subangular blocky structure; friable; few fine roots; few clay films on faces of peds; neutral; clear smooth boundary.

Bt2—14 to 32 inches; strong brown (7.5YR 4/6) silty clay loam; moderate medium subangular blocky structure; firm; few distinct clay films on faces of peds; few fine rounded dark concretions; medium acid; clear smooth boundary.

Bt3—32 to 47 inches; strong brown (7.5YR 4/6) silt loam; moderate coarse subangular blocky structure parting to moderate medium subangular blocky; firm; few distinct clay films on faces of peds; common medium flat dark concretions; medium acid; gradual smooth boundary.

BC—47 to 60 inches; brown (7.5YR 4/4) silt loam; weak and moderate coarse subangular blocky structure; firm; very few distinct clay films on faces of peds; few fine rounded dark concretions; strongly acid.

The thickness of the solum ranges from 40 to 78 inches. Reaction ranges from medium acid to very strongly acid throughout the profile unless the surface layer has been limed.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4.

The Bt and BC horizons have hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 6. The Bt horizon is silt loam or silty clay loam.

Some pedons have a C horizon. This horizon has colors similar to those of the B horizon. It is silt loam.

Mhoon Series

The Mhoon series consists of very deep, poorly drained, slowly permeable soils on flood plains. These soils formed in loamy alluvium. Slopes range from 0 to 2 percent. Mhoon soils are fine-silty, mixed, nonacid, thermic Typic Fluvaquents.

Mhoon soils are associated on the landscape with Commerce, Openlake, Bardwell, and Crevasse soils. Commerce soils are somewhat poorly drained, and Bardwell soils are moderately well drained. Openlake soils are more clayey than the Mhoon soils, and Crevasse soils are more sandy.

Typical pedon of Mhoon silt loam, ponded; about 6.6 miles southeast of Clinton; about 1.6 miles south of Mt. Moriah Church; about 277 yards south of Bayou du Chien Creek, in Hickman County; on soil map sheet 26, east-west about 1,067,800 feet and north-south about 122,450 feet by the Kentucky coordinate grid system:

A—0 to 10 inches; dark grayish brown (2.5Y 4/2) silt loam; weak medium granular structure; friable; few fine roots; mildly alkaline; clear smooth boundary.

Bg1—10 to 30 inches; gray (5Y 5/1) silt loam; common fine distinct brown (10YR 5/3) mottles; weak medium subangular blocky structure; firm; few fine roots; mildly alkaline; clear smooth boundary.

Bg2—30 to 40 inches; gray (10YR 6/1) silt loam; common fine distinct brown (10YR 5/3) mottles; weak medium subangular blocky structure; firm; mildly alkaline; clear smooth boundary.

Cg—40 to 60 inches; gray (10YR 6/1) silt loam; common medium distinct brown (10YR 5/3) and yellowish brown (10YR 5/4) mottles; massive; firm; slightly acid.

Reaction ranges from slightly acid to mildly alkaline in the A horizon and from slightly acid to moderately alkaline in B and C horizons.

The A horizon generally has hue of 10YR, value of 3 or 4, and chroma of 1 or 2 or is neutral in hue and has value of 3 or 4. In some pedons, however, it has hue of 2.5Y, value of 4, and chroma of 2.

The Bg horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 to 6, and chroma of 1 or 2 or is neutral in hue and has value of 4. It has mottles in shades of gray or brown. It is silt loam, silty clay loam, or clay loam and commonly is stratified.

The Cg horizon has the same ranges in color and texture as the Bg horizon.

Molena Series

The Molena series consists of very deep, somewhat excessively drained, rapidly permeable soils on steep side slopes in the uplands. These soils formed in coastal plain sediments. Slopes range from 20 to 35 percent.

Molena soils are sandy, mixed, thermic Psammentic Hapludults. The Molena soils in this survey area are taxadjuncts to the series because the content of clay does not decrease from its maximum amount by more than 20 percent within 1.5 meters of the surface. The soils are classified as Psammentic Paleudults. This difference does not significantly affect the use, management, or behavioral characteristics of the soils.

Molena soils are associated on the landscape with Memphis, Loring, and Saffell soils. Memphis and Loring soils are in fine-silty families, and Saffell soils are in a loamy-skeletal family.

Typical pedon of Molena loamy sand, in an area of Memphis-Molena complex, 20 to 40 percent slopes, severely eroded; about 4.9 miles west of Bardwell; about 1.4 miles west of the intersection of Kentucky Highways 1022 and 1203; about 100 feet east of an

abandoned railroad, in Hickman County; on soil map sheet 7, east-west about 1,020,450 feet and north-south about 212,650 feet by the Kentucky coordinate grid system:

A—0 to 2 inches; very dark grayish brown (10YR 3/2) loamy sand; weak and moderate fine granular structure; very friable; many fine roots; medium acid; clear smooth boundary.

BA—2 to 6 inches; dark brown (10YR 4/3) loamy sand; weak medium subangular blocky structure parting to weak fine granular; very friable; many fine roots; strongly acid; clear wavy boundary.

E—6 to 12 inches; yellowish brown (10YR 5/4) sand; weak fine granular structure; very friable; common fine roots; medium acid; clear wavy boundary.

Bt1—12 to 36 inches; yellowish brown (10YR 5/6) and strong brown (7.5YR 5/6) loamy sand that has lamellae of fine sandy loam; moderate medium granular structure; sand grains coated and bridged with clay; very friable; few fine roots; medium acid; gradual wavy boundary.

Bt2—36 to 60 inches; strong brown (7.5YR 5/8) and yellowish brown (10YR 5/6) loamy sand that has lamellae of fine sandy loam; moderate medium granular structure; sand grains coated and bridged with clay; very friable; very strongly acid.

The thickness of the solum ranges from 40 to 72 inches. Reaction ranges from very strongly acid to medium acid throughout the profile unless the surface layer has been limed.

The A and BA horizons have hue of 10YR or 7.5YR, value of 3 or 4, and chroma of 2 to 4. The BA horizon is loamy sand or sandy loam.

The E horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. It is sand, loamy sand, or sandy loam.

The Bt horizon has hue of 10YR, 7.5YR, or 5YR, value of 4 or 5, and chroma of 4 to 8. It is dominantly loamy sand, loamy fine sand, or sandy loam but has lamellae of fine sandy loam.

Some pedons have a C horizon. This horizon has colors and textures similar to those of the Bt horizon.

Openlake Series

The Openlake series consists of very deep, somewhat poorly drained, very slowly permeable soils in slack-water areas on flood plains along the Mississippi River. These soils formed in clayey alluvium. Slopes range from 0 to 2 percent. Openlake soils are fine, montmorillonitic, nonacid, thermic Vertic Haplaquepts.

Openlake soils are associated on the landscape with Commerce and Mhoon soils, which are in fine-silty families.

Typical pedon of Openlake silty clay, frequently flooded (fig. 19); about 4.6 miles west of Berkley, across the Mississippi River, on Island Nos. 2, 3, and 4, in Carlisle County; about 0.6 mile east of the line between Carlisle County, Kentucky, and Mississippi County, Missouri; on soil map sheet 10, east-west about 999,700 feet and north-south about 191,000 feet by the Kentucky coordinate grid system:

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silty clay; many medium faint dark gray (10YR 4/1) and few fine faint very dark gray mottles; weak medium granular structure; firm; common fine roots; mildly alkaline; clear smooth boundary.

BA—8 to 20 inches; dark grayish brown (10YR 4/2) silty clay; many medium faint dark gray (10YR 4/1) and common fine faint very dark gray (10YR 3/1) mottles; moderate coarse subangular blocky structure parting to weak and moderate medium subangular and angular blocky; firm; few fine roots; mildly alkaline; clear smooth boundary.

Bg1—20 to 27 inches; dark gray (10YR 4/1) silty clay; common medium faint dark grayish brown (10YR 4/2) and very dark grayish brown (10YR 3/2) and common fine distinct dark brown (10YR 4/3) mottles; weak medium angular blocky structure parting to weak fine angular blocky; firm; few fine roots; few slickensides; mildly alkaline; clear smooth boundary.

Bg2—27 to 34 inches; dark grayish brown (10YR 4/2) silty clay loam; dark gray (10YR 4/1) faces of peds; many medium faint very dark grayish brown (10YR 3/2) mottles; moderate medium subangular and angular blocky structure parting to moderate fine angular blocky; firm; few slickensides; neutral; gradual smooth boundary.

Bg3—34 to 52 inches; dark grayish brown (10YR 4/2) silty clay; dark gray (10YR 4/1) and very dark gray (10YR 3/1) faces of peds; common medium faint very dark grayish brown (10YR 3/2) mottles; weak and moderate medium angular blocky structure parting to weak and moderate fine angular blocky; firm; few slickensides; neutral; gradual smooth boundary.

Bg4—52 to 65 inches; dark gray (10YR 4/1) silty clay; many medium faint very dark grayish brown (10YR 3/2) and dark grayish brown (10YR 4/2) mottles; moderate medium subangular and angular blocky structure parting to weak and moderate fine angular blocky; firm; few slickensides; neutral.

The thickness of the solum ranges from 37 to 80

inches. Reaction ranges from strongly acid to mildly alkaline throughout the profile.

The Ap horizon has hue of 10YR or 2.5Y, value of 3 or 4, and chroma of 1 to 3.

The BA horizon has hue of 10YR, value of 3 or 4, and chroma of 1 or 2. It is clay, silty clay, or silty clay loam.

The Bg horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 1 or 2. It has mottles in shades of brown or gray. It is silty clay loam, silty clay, or clay.

Some pedons have a C horizon. This horizon has colors and textures similar to those of the Bg horizon. In some pedons it is stratified with loam, silt loam, loamy sand, or sandy loam.

Robinsonville Series

The Robinsonville series consists of very deep, well drained soils that are moderately permeable or moderately rapidly permeable. These soils formed in loamy alluvium on the flood plains along the Mississippi River. Slopes range from 0 to 2 percent. Robinsonville soils are coarse-loamy, mixed, nonacid, thermic Typic Udifluvents.

Robinsonville soils are associated on the landscape with Crevasse, Commerce, Mhoon, Bardwell, and Bowdre soils. Crevasse soils are in a sandy family. Commerce, Mhoon, and Bardwell soils are in fine-silty families. Bowdre soils are in a clayey over loamy family.

Typical pedon of Robinsonville silt loam, in an area of Robinsonville-Crevasse complex, frequently flooded; about 7 miles southwest of Bardwell; about 7,500 feet west of the southern tip of Forked Lake; about 1,000 feet east of the bank of the Mississippi River, in Carlisle County; on soil map sheet 10, east-west about 1,010,600 feet and north-south about 201,600 feet by the Kentucky coordinate grid system:

Ap—0 to 8 inches; dark brown (10YR 4/3) silt loam; moderate fine granular structure; friable; many fine roots; mildly alkaline; clear smooth boundary.

C1—8 to 13 inches; dark brown (10YR 4/3) loam; massive; friable; few fine roots; mildly alkaline; clear smooth boundary.

C2—13 to 23 inches; dark brown (10YR 4/3) very fine sandy loam; massive; very friable; few fine roots; mildly alkaline; gradual smooth boundary.

C3—23 to 46 inches; dark yellowish brown (10YR 4/4) very fine sandy loam; few fine faint dark grayish brown mottles; massive; loose; common thin bedding planes; stratified with thin lenses of loamy very fine sand; mildly alkaline; clear smooth boundary.

2Bwb—46 to 60 inches; dark grayish brown (10YR 4/2) and dark brown (10YR 4/3) silt loam; weak and moderate medium subangular blocky structure; friable; stratified with silty clay loam; mildly alkaline.

Reaction ranges from slightly acid to moderately alkaline throughout the profile.

The Ap horizon has hue of 10YR, value of 3 to 5, and chroma of 2 to 4.

The C horizon has hue of 10YR. It has value of 4 and chroma of 2 to 4 or has value of 5 or 6 and chroma of 3 or 4. It is mainly silt loam, loam, fine sandy loam, or very fine sandy loam.

The 2Bwb horizon has colors and textures similar to those of the C horizon.

Routon Series

The Routon series consists of very deep, poorly drained, slowly permeable soils on low stream terraces. These soils formed in loamy alluvium that washed from loessial soils on uplands. Slopes range from 0 to 2 percent. Routon soils are fine-silty, mixed, thermic Typic Ochraqualfs.

Routon soils are commonly associated on the landscape with Calloway and Center soils and with Adler, Convent, and Mhoon soils. Calloway soils have a slowly permeable fragipan. Center soils are moderately well drained or somewhat poorly drained. Adler, Convent, and Mhoon soils are on flood plains.

Typical pedon of Routon silt loam, in an area of Routon-Center silt loams, 0 to 2 percent slopes, rarely flooded; about 6.9 miles northeast of Clinton; about 550 feet east of the end of Dean Road, in Hickman County; on soil map sheet 20, east-west about 1,072,700 feet and north-south about 165,600 feet by the Kentucky coordinate grid system:

Ap—0 to 10 inches; brown (10YR 5/3) silt loam; common medium distinct grayish brown (10YR 5/2) mottles; weak fine granular structure; friable; many fine roots; strongly acid; clear smooth boundary.

Btg1—10 to 16 inches; gray (10YR 6/1) silt loam; common medium distinct pale brown (10YR 6/3) and common fine distinct yellowish brown (10YR 5/6) mottles; weak and moderate medium subangular blocky structure; friable; few fine roots; few clay films on faces of peds; few dark concretions; slightly acid; clear smooth boundary.

Btg2—16 to 30 inches; light brownish gray (10YR 6/2) silty clay loam; common medium distinct yellowish brown (10YR 5/6) and pale brown (10YR 6/3) mottles; moderate coarse prismatic structure parting to weak and moderate medium subangular blocky; firm; few fine roots; few clay films on faces of peds; few dark concretions; medium acid; gradual smooth boundary.

Btg3—30 to 36 inches; light brownish gray (10YR 6/2) silty clay loam; common medium distinct yellowish brown (10YR 5/6) and pale brown (10YR 6/3) mottles; weak medium subangular blocky structure; firm; few clay films on faces of peds; common dark concretions; slightly acid; gradual smooth boundary.

BC—36 to 60 inches; light brownish gray (10YR 6/2) silty clay loam; many medium distinct yellowish brown (10YR 5/6) and few fine distinct pale brown (10YR 6/3) mottles; weak coarse subangular blocky structure; very firm; common dark concretions; medium acid.

The thickness of the solum ranges from 40 to 65 inches. Reaction ranges from very strongly acid to slightly acid in the A and Bt horizons and from strongly acid to neutral in the lower part of the profile.

The Ap horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 or 3.

The part of the Btg horizon within a depth of 30 inches has hue of 10YR or 2.5Y and has value of 6 or 7 and chroma of 2 or value of 5 to 7 and chroma of 1, or it is neutral in hue. The part below a depth of 30 inches has hue of 10YR or 2.5Y, value of 5 to 7, and chroma of 1 or 2 or is neutral in hue. This horizon has mottles in shades of brown, yellow, or gray. It is silt loam or silty clay loam.

The BC horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2 to 6 or hue of 7.5YR, value of 4 or 5, and chroma of 4. It has mottles in shades of brown, yellow, or gray. In some pedons it is mottled and does not have a dominant matrix color. This horizon is silt loam or silty clay loam.

Saffell Series

The Saffell series consists of very deep, well drained, moderately permeable soils on moderately steep and steep side slopes in the uplands. These soils formed in loamy and gravelly coastal plain sediments. Slopes range from 12 to 30 percent. Saffell soils are loamy-skeletal, siliceous, thermic Typic Hapludults.

Saffell soils are associated on the landscape with Memphis, Loring, and Molena soils. Memphis and Loring soils are in fine-silty families, and Molena soils are in a sandy family.

Typical pedon of Saffell very gravelly loam (fig. 20), in an area of Loring-Memphis-Saffell complex, 12 to 30 percent slopes, severely eroded; about 8.7 miles northeast of Bardwell; about 1.7 miles northeast of Cunningham; about 2,200 feet north of the intersection of California Road and Wilson Creek, in Carlisle County; on soil map sheet 3, east-west about 1,088,200 feet and north-south about 231,200 feet by the Kentucky coordinate grid system:

A—0 to 4 inches; dark grayish brown (10YR 4/2) very gravelly loam; weak fine granular structure; very friable; many fine roots; about 35 percent rounded gravel; mildly alkaline; abrupt smooth boundary.

E—4 to 11 inches; yellowish brown (10YR 5/4) very gravelly silt loam; weak medium subangular blocky structure parting to weak fine granular; friable; many fine roots; few dark brown (10YR 4/3) organic coatings; about 50 percent rounded gravel; neutral; clear smooth boundary.

Bt1—11 to 31 inches; strong brown (7.5YR 5/6) very gravelly sandy loam; weak medium subangular blocky structure; friable; few fine roots; few clay films on faces of peds; about 50 percent rounded gravel; slightly acid; clear smooth boundary.

Bt2—31 to 40 inches; strong brown (7.5YR 5/6) very gravelly clay loam; moderate medium subangular blocky structure; firm; few clay films on faces of peds; about 50 percent rounded gravel; very strongly acid; gradual smooth boundary.

Bt3—40 to 48 inches; strong brown (7.5YR 5/6) very gravelly clay loam; moderate medium subangular blocky structure; friable; few clay films on faces of peds; about 40 percent rounded gravel; very strongly acid; clear smooth boundary.

C—48 to 60 inches; strong brown (7.5YR 4/6) gravelly sandy loam; weak medium subangular blocky structure; friable; few brownish yellow (10YR 6/6) and light yellowish brown (10YR 6/4) silt coatings on faces of peds; about 20 percent rounded gravel; very strongly acid.

The thickness of the solum ranges from 40 to more than 60 inches. Reaction is strongly acid or very strongly acid throughout the profile unless the surface layer has been limed. The content of rock fragments ranges from 25 to 35 percent in the A horizon, from 15 to 65 percent in the E and Bt horizons, and from 20 to 80 percent in the C horizon.

The A horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 2 to 4.

The E horizon has hue of 10YR, value of 4 or 5, and chroma of 4 to 6 or has hue of 7.5YR, value of 4 or 5, and chroma of 4. In the fine-earth fraction, it is silt loam, loam, or fine sandy loam.

The Bt horizon has hue of 7.5YR or 5YR, value of 4 to 6, and chroma of 4 to 8. In the fine-earth fraction, it is loam, fine sandy loam, sandy clay loam, sandy loam, or clay loam.

The C horizon has colors similar to those of the Bt horizon. In the fine-earth fraction, it is loamy sand, sandy loam, or sandy clay loam.

Formation of the Soils

This section relates the factors of soil formation to the soils in Carlisle and Hickman Counties and explains the processes of soil formation.

Factors of Soil Formation

The interaction of five major factors of soil formation results in differences among soils. These factors are the physical composition of the parent material; the climate during and after accumulation of the parent material; the kinds of plants and animals living on and in the soil; relief, or lay of the land, and its effect on drainage; and the length of time that the processes of soil formation have been active.

Parent Material

Parent material is the unconsolidated mineral or organic material in which soils form. Most kinds of parent material are derived from the weathering or decomposition of rocks and minerals. The soils in Carlisle and Hickman Counties formed in coastal plain deposits, eolian deposits (loess), and alluvium.

Unconsolidated coastal plain sediments contain gravel, sand, silt, and clay deposited during former extensions of the oceans. These marine deposits are geologically so recent that they have not consolidated into hard bedrock. Saffell and Molena soils formed in gravelly and sandy coastal plain deposits, respectively. These coastal plain sediments were left by the northern extension of the Gulf of Mexico during the Tertiary and Quaternary geologic periods.

Eolian material has been transported and deposited by the wind. Windblown deposits of dominantly sand-sized particles are called dunes. Winddblown material that is made up dominantly of silt- and clay-sized particles is called loess. The word "loess" means loose, in the sense of being porous and unconsolidated. Loess from the Quaternary geologic period blankets the entire survey area, except for areas where it has been removed by erosion. Memphis, Loring, and Calloway soils formed in loess.

Alluvium is material that has been carried and deposited by running water. It contains various mixtures of gravel, sand, silt, and clay. It is an extensive parent material in the survey area. Bowdre, Commerce, Crevasse, Keyespoint, Bardwell, Mhoon, Openlake, and Robinsonville soils formed in alluvium along the Mississippi River. Adler, Convent, Dekoven, Iuka, and Mhoon soils formed in alluvium along the major streams in the survey area. Center and Routon soils, which are on low terraces along the major streams in the area, formed in loamy alluvium washed from soils that formed in loess on uplands.

Relief

Relief consists of the elevations or inequalities of a land surface, considered collectively. It is the configuration of the land surface, or the shape and gradient of the surface. It influences soil formation through its effects on runoff, leaching and percolation, depth to the water table, exposure to the sun and chemical weathering, accumulation of organic matter, and erosion.

The amount of precipitation that runs off the surface of the soil is determined largely by relief. The steeper the relief, the greater the amount of runoff. Runoff reduces the amount of water that leaches or percolates through the soil. Generally, the soils that are leached less often are characterized by less translocation of colloidal clay and more base cations. The soils that are routinely leached tend to be more acid.

The depth to a water table is influenced by relief. Water enters the soils in nearly level areas. Little of the water runs off the surface. If these nearly level soils are not highly permeable, the buildup of water can result in a high water table. This high water table is evidenced by gray colors in the soil profile. Routon, Calloway, and Convent are examples of nearly level soils that have a high water table. The steeper soils, such as Memphis soils, tend to have a water table that is farther from the surface.

The influences of soil temperature and the plant cover on soil formation are more pronounced on the steeper slopes. These influences are most readily apparent when north-facing and south-facing slopes are compared. South-facing slopes are slightly warmer than

north-facing slopes, erode and weather at a faster rate, and have a different plant cover. These differences, however, have not affected soil formation in Carlisle and Hickman Counties to any great extent.

The hazard of erosion increases as the length and steepness of slopes increase. Because of erosion, the steeper soils generally are shallower than the less sloping soils. The gently sloping soils on ridges in Carlisle and Hickman Counties generally are only slightly eroded, whereas the sloping or steeper soils are severely eroded. Erosion has removed several feet of loess on steep and very steep side slopes and has uncovered previously buried coastal plain sediments.

Climate

Climate affects the physical, chemical, and biological relationships in soils. It influences the kind and number of plants and animals, the weathering and decomposition of rocks and minerals, the extent of erosion, and the rate of soil formation.

The climate in Carlisle and Hickman Counties is humid and temperate, as is characteristic of the basins of the Ohio and Mississippi Rivers. The average annual precipitation is 52 inches, and the mean annual air temperature is 57 degrees. The soils are seldom completely dry and are frozen for only short periods. Therefore, the processes of soil formation have continued almost uninterrupted. Nearly continual leaching has moved many of the soluble bases and clay minerals from the upper horizons to the lower horizons and, in some areas, completely from the soil. As a result, many of the soils in the survey area are acid, have a loamy surface layer, and have a subsoil in which clay from the surface layer has accumulated. Examples are Center, Loring, and Memphis soils.

The formation of a fragipan in some of the soils in the survey area is a direct result of the humid and temperate climate. A fragipan does not form in areas of arid climates where there is little rainfall. A genetic fragipan forms in areas where rainfall is abundant, leaching is significant, drainage is impeded, and the soils generally are nearly level to strongly sloping. In this survey area the soils that have a fragipan are on stream terraces or uplands. Calloway and Loring soils are examples.

Plant and Animal Life

Plants generally have influenced the soils in Carlisle and Hickman Counties more than animals. Plants affect soil formation mainly by adding organic matter to the soils. Animals, bacteria, and fungi contribute to soil formation by converting the remains of plants to organic matter and plant nutrients. The organic matter imparts a dark color to the soil material, and the humus, or decomposed organic matter, aids in the formation of soil structure.

Soil color is modified by the additions of organic material. Generally, the darker colored soils have a higher content of organic matter than the lighter colored soils. Dekoven and Openlake are examples of soils in the survey area that are high in content of organic matter and have very dark horizons.

Soils that formed under grassland vegetation have more organic matter than soils that formed under hardwoods. Grassland humus generally is of better quality than woodland humus because it is more resistant to further decomposition. The decay of forest debris causes the formation of various organic acids, including carbonic acid. These acids accelerate the leaching of basic cations in the soil solution, resulting in an acid soil. Most of the soils in the survey area are acid and formed under hardwoods.

Animals, such as moles, mice, groundhogs, and crawfish, burrow through and mix the soil. Many forms of small animal life living in or on the soil, such as earthworms, grubs, and insects, alter the soil. Earthworms and ants are primarily responsible for keeping the soil aerated and porous through their network of tunnels. In Carlisle and Hickman Counties, the soils on the bottom land along the Mississippi River have the highest population of earthworms and the highest level of natural fertility. Mixing of soil material by rodents has not significantly influenced the soils in Carlisle and Hickman Counties.

Time

Time is required for changes to take place in the various kinds of parent material. Parent material, relief, climate, and plant and animal life determine the nature of the soil environment. The time needed for weathering of the different kinds of parent material and the resulting soil formation is relative to environmental conditions. For example, horizon development takes less time in humid regions than in dry regions because soils are leached more often in the humid regions. Also, some kinds of parent material are more resistant to weathering than others and require more time for changes to occur.

In general, the relative maturity of a soil is described in terms of the changes that have occurred in the parent material and the degree of horizon development rather than in terms of years. Soils that show a moderate or strong degree of horizon development are considered mature or old. Soils on uplands, such as Memphis, Loring, and Calloway soils, are considered to be mature because they have distinct horizons. Their

parent material has undergone significant changes. Soils on flood plains, such Convent, Adler, and Crevasse soils, are considered to be young because their parent material has been only slightly altered since it was deposited.

Processes of Soil Formation

The formation of a succession of layers, or horizons, in soils is the result of one or more of the following processes—the accumulation of organic matter; the leaching of carbonates and other soluble minerals; the chemical weathering, chiefly through hydrolysis, of primary minerals into silicate clay minerals; the translocation of silicate clays and probably some silt-sized particles from one horizon to another; and the reduction and transfer of iron.

Several of these processes have been active in most of the soils in Carlisle and Hickman Counties. The interaction of the first four processes is reflected in the strongly expressed horizons of Memphis soils. All five processes have probably been active in the formation of the moderately well drained Loring soils.

Some organic matter has accumulated in all of the soils in Carlisle and Hickman Counties. This accumulation has resulted in the formation of a surface layer, or A horizon. Most of the uneroded soils in the two counties have a moderate content of organic matter in the surface layer.

Most of the soils in the two counties are acid in the upper part, although they formed in material that is not acid. Carbonates and other soluble materials have been partially leached into the lower layers or out of the soil profile. Center and Routon are examples of soils in which this process has occurred.

The translocation of clay minerals is an important process in the horizon development of many soils in the survey area. As clay minerals are removed from the A horizon, they accumulate as clay films on the faces of peds and along pores and root channels in the B horizon. This process is evident in all of the soils on terraces and uplands in Carlisle and Hickman Counties.

A fragipan has formed in the B horizon of some of the moderately well drained and somewhat poorly drained soils on uplands and terraces. The fragipan is a dense, compact layer that is hard or very hard when dry, is brittle when moist, and tends to rupture suddenly, rather than deform slowly, when lateral pressure is applied. The fragipan generally is mottled, is slowly permeable or very slowly permeable, and has few to many bleached fracture planes that form polygons. Loring and Calloway are the soils in Carlisle and Hickman Counties that have a fragipan.

The reduction and transfer of iron occur in all soils that are not characterized by good natural drainage. The reduction process is known as gleying, which is evidenced by gray colors and mottles in the soils. Part of the iron may be reoxidized and segregated under a fluctuating water table, forming yellowish brown, strong brown, and other brightly colored mottles in an essentially gray matrix in the subsoil. Nodules or concretions of iron, manganese, or both commonly form under these conditions. Dekoven, Mhoon, and Routon are examples of soils in which this process has occurred.

As silicate clay forms primary minerals, some iron is commonly freed as hydrated oxides. These oxides are more or less red. Even if present in small amounts, they give a brownish color to the soil material. They are largely responsible for the strong brown and yellowish brown colors that dominate the subsoil of many soils in Carlisle and Hickman Counties.

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Glossary

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Aspect. The direction in which a slope faces. Where the slope is more than 15 percent, a warm aspect faces an azimuth of 135 to 315 degrees and a cool aspect faces an azimuth of 315 to 135 degrees.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, and K), expressed as a percentage of the total cation-exchange capacity.

Bedding planes. Fine stratifications, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediments.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bisequum. Two sequences of soil horizons, each of which consists of an illuvial horizon and the overlying eluvial horizons.

Bottom land. The normal flood plain of a stream, subject to flooding.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Channery soil. A soil that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches along the longest axis. A single piece is called a channer.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard, compacted layers to a depth below normal plow depth.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface

of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Climax vegetation. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15 to 38 centimeters (6 to 15 inches) long.

Coarse textured soil. Sand or loamy sand.

Cobblestone (or cobble). A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex slope. Irregular or variable slope. Planning or establishing terraces, diversions, and other water-control structures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Conservation tillage. A tillage system that does not invert the soil and that leaves a protective amount of crop residue on the surface throughout the year.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are:

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Depth, soil. Generally, the thickness of the soil over bedrock. Very deep soils are more than 60 inches deep over bedrock; deep soils, 40 to 60 inches; moderately deep soils, 20 to 40 inches; and shallow soils, less than 20 inches.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants

throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, for example, fire, that exposes the surface.

Excess fines (in tables). Excess silt and clay in the soil. The soil is not a source of gravel or sand for construction purposes.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fine-earth fraction. The portion of the soil that can pass through a number 10 (2 millimeter) U.S. standard sieve.

Fine textured soil. Sandy clay, silty clay, or clay.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist, 6 to 15 inches (15 to 38 centimeters) long.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other

elements in the profile and in gray colors and mottles.

Graded stripcropping. Growing crops in strips that grade toward a protected waterway.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.6 centimeters) in diameter.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water (geology). Water filling all the unblocked pores of the material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the "Soil Survey Manual." The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, any plowed or disturbed surface layer.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an O, A, or E horizon. The B horizon is in part a layer of transition from the overlying horizon to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) granular, prismatic, or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.—Soft, consolidated bedrock beneath the soil.

R layer.—Hard, consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon but can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Infiltration. The downward entry of water into the immediate surface of soil or other material. This contrasts with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are:

Basin.—Water is applied rapidiy to nearly level plains surrounded by levees or dikes.
Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.
Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.
Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.
Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.
Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.
Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.
Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.
Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low strength. The soil is not strong enough to support loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, or fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, or silty clay loam.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Munsell notation. A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan.*

Parent material. The unconsolidated organic and mineral material in which soil forms.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affects the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches

per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Subsurface tunnels or pipelike cavities are formed by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poor filter (in tables). Because of rapid permeability, the soil may not adequately filter effluent from a waste disposal system.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Extremely acid	below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rill. A steep-sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Rippable. Bedrock or hardpan can be excavated using a single-tooth ripping attachment mounted on a tractor with a 200-300 drawbar horsepower rating.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-sized particles.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of

the surface layer or of the substratum. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silica-sesquioxide ratio. The ratio of the number of molecules of silica to the number of molecules of alumina and iron oxide. The more highly weathered soils or their clay fractions in warm-temperate, humid regions, and especially those in the tropics, generally have a low ratio.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slick spot. A small area of soil having a puddled, crusted, or smooth surface and an excess of exchangeable sodium. The soil is generally silty or clayey, is slippery when wet, and is low in productivity.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance. The slope classes in this survey are as follows:

Nearly level	0 to 2 percent
Gently sloping	2 to 6 percent
Sloping	6 to 12 percent
Moderately steep	12 to 20 percent
Steep	20 to 30 percent
Very steep	30 to 70 percent

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to soil blowing and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular. Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from soil blowing and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Breaking up a compact subsoil by pulling a special chisel through the soil.

Substratum. The part of the soil below the solum.

Subsurface layer. Technically, the E horizon. Generally refers to a leached horizon lighter in color and lower in organic matter content than the overlying surface layer.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour across sloping soils. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay.* The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, in soils in extremely small amounts. They are essential to plant growth.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Weathering. All physical and chemical changes produced by atmospheric agents in rocks or other deposits at or near the earth's surface. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

(Recorded in the period 1964-87 at Bardwell, Kentucky)

Month	Temperature						Precipitation				
				2 years in 10 will have--				2 years in 10 will have--			
	Average daily maximum	Average daily minimum	Average daily	Maximum temperature higher than--	Minimum temperature lower than--	Average number of growing degree days*	Average	Less than--	More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January-----	41.9	23.2	32.6	69	-8	17	3.35	1.52	4.90	6	5.7
February----	47.4	27.4	37.4	74	0	19	3.37	2.01	4.57	6	4.4
March-------	58.7	37.3	48.0	81	15	125	4.70	2.45	6.66	8	2.4
April-------	70.2	47.1	58.7	87	27	271	5.74	3.11	8.05	9	.0
May---------	78.6	55.2	66.9	93	35	524	5.34	3.05	7.37	8	.0
June--------	86.8	63.3	75.1	97	47	753	4.02	2.38	5.49	7	.0
July--------	90.2	67.0	78.6	100	53	887	4.74	1.96	7.08	6	.0
August------	88.2	64.4	76.3	99	50	815	4.05	1.91	5.89	6	.0
September---	81.9	57.8	69.9	95	38	597	3.74	1.86	5.37	5	.0
October-----	71.4	45.9	58.7	88	26	284	3.23	1.59	4.63	5	.0
November----	58.6	37.6	48.1	79	15	76	4.73	2.60	6.60	7	.4
December----	47.7	29.3	38.5	70	5	22	5.18	2.25	7.67	8	1.9
Yearly:											
Average---	68.5	46.3	57.4	---	---	---	---	---	---	---	---
Extreme---	---	---	---	100	-9	---	---	---	---	---	---
Total-----	---	---	---	---	---	4,390	52.19	44.26	59.55	81	14.8

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50 degrees F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

(Recorded in the period 1964-87 at Bardwell, Kentucky)

Probability	Temperature		
	24 °F or lower	28 °F or lower	32 °F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	Apr. 5	Apr. 12	Apr. 20
2 years in 10 later than--	Mar. 29	Apr. 7	Apr. 15
5 years in 10 later than--	Mar. 17	Mar. 28	Apr. 6
First freezing temperature in fall:			
1 year in 10 earlier than--	Oct. 30	Oct. 18	Sept. 30
2 years in 10 earlier than--	Nov. 4	Oct. 24	Oct. 6
5 years in 10 earlier than--	Nov. 15	Nov. 4	Oct. 16

TABLE 3.--GROWING SEASON

(Recorded in the period 1964-87 at Bardwell, Kentucky)

Probability	Daily minimum temperature during growing season		
	Higher than 24 °F	Higher than 28 °F	Higher than 32 °F
	Days	Days	Days
9 years in 10	219	197	173
8 years in 10	227	205	180
5 years in 10	243	220	193
2 years in 10	258	234	206
1 year in 10	266	242	212

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Carlisle County	Hickman County	Total-- Area	Total-- Extent
		Acres	Acres	Acres	Pct
Ad	Adler silt loam, frequently flooded	8,060	8,530	16,590	5.7
Bd	Bardwell silt loam, frequently flooded	1,840	1,490	3,330	1.1
Br	Bowdre-Robinsonville complex, frequently flooded	720	980	1,700	0.6
CaA	Calloway silt loam, 0 to 3 percent slopes	1,570	3,170	4,740	1.6
CbA	Calloway silt loam, 0 to 2 percent slopes, rarely flooded	70	480	550	0.2
CeA	Center silt loam, 0 to 3 percent slopes, rarely flooded	380	1,200	1,580	0.5
Cm	Commerce silt loam, frequently flooded	1,510	2,270	3,780	1.3
Cn	Convent-Adler silt loams, frequently flooded	16,490	22,730	39,220	13.6
Ct	Convent-Mhoon silt loams, frequently flooded	3,360	8,970	12,330	4.3
Cv	Crevasse sand, frequently flooded	240	1,270	1,510	0.5
De	Dekoven silt loam, overwash, occasionally flooded	130	140	270	0.1
Iu	Iuka sandy loam, occasionally flooded	600	170	770	0.3
Kb	Keyespoint and Bardwell soils, frequently flooded	1,660	1,580	3,240	1.1
LoB	Loring silt loam, 2 to 6 percent slopes	22,520	28,320	50,840	17.6
LoB3	Loring silt loam, 2 to 6 percent slopes, severely eroded	3,490	7,491	10,981	3.8
LoC2	Loring silt loam, 6 to 12 percent slopes, eroded	590	1,310	1,900	0.6
LoC3	Loring silt loam, 6 to 12 percent slopes, severely eroded	13,070	21,680	34,750	12.0
LoD3	Loring silt loam, 12 to 20 percent slopes, severely eroded	14,950	17,170	32,120	11.1
LsE3	Loring-Memphis-Saffell complex, 12 to 30 percent slopes, severely eroded	14,220	8,280	22,500	7.8
MeB	Memphis silt loam, 2 to 6 percent slopes	2,320	4,690	7,010	2.4
MeC2	Memphis silt loam, 6 to 12 percent slopes, eroded	650	1,080	1,730	0.6
MmF3	Memphis-Molena complex, 20 to 40 percent slopes, severely eroded	2,540	640	3,180	1.1
Mo	Mhoon silt loam, ponded	2,340	2,800	5,140	1.8
Op	Openlake silty clay, frequently flooded	3,952	4,600	8,552	3.0
Pt	Pits-Dumps complex	140	20	160	0.1
Rc	Robinsonville-Crevasse complex, frequently flooded	2,280	1,380	3,660	1.3
RnA	Routon-Center silt loams, 0 to 2 percent slopes, rarely flooded	2,420	3,140	5,560	1.9
RtA	Routon-Center silt loams, 0 to 2 percent slopes, occasionally flooded	0	1,290	1,290	0.4
	Water areas more than 40 acres in size	5,242	5,055	10,297	3.6
	Total	127,354	161,926	289,280	100.0

* Less than 0.1 percent.

TABLE 5.--LAND CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE

(Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil)

Soil name and map symbol	Land capability	Corn	Soybeans	Wheat	Alfalfa hay	Grass-legume hay	Pasture
		Bu	Bu	Bu	Ton	Ton	AUM*
Ad-------------- Adler	IIw	170	50	---	---	5.0	10.0
Bd-------------- Bardwell	IIIw	170	50	---	---	---	---
Br**------------ Bowdre-Robinsonville	IVw	140	35	---	---	---	---
CaA, CbA-------- Calloway	IIw	130	40	40	---	3.5	7.0
CeA------------- Center	IIw	140	40	50	3.5	4.0	8.0
Cm-------------- Commerce	IVw	130	40	---	---	---	---
Cn**------------ Convent-Adler	IIw	170	50	---	---	5.0	10.0
Ct**------------ Convent-Mhoon	IIIw	120	40	---	---	4.0	8.0
Cv-------------- Crevasse	IVs	---	20	---	---	---	---
De-------------- Dekoven	IIIw	130	40	---	---	4.0	8.0
Iu-------------- Iuka	IIw	140	50	---	---	4.0	8.0
Kb**------------ Keyespoint and Bardwell	IIIw	140	40	---	---	---	---
LoB------------- Loring	IIe	150	40	60	4.0	5.0	10.0
LoB3------------ Loring	IIIe	130	35	45	3.5	3.5	8.0
LoC2------------ Loring	IIIe	130	35	45	4.0	4.0	9.0
LoC3------------ Loring	IVe	110	30	40	---	3.0	6.0
LoD3------------ Loring	VIe	---	---	---	---	2.5	5.0
LsE3**---------- Loring-Memphis-Saffell	VIIe	---	---	---	---	---	4.0

See footnotes at end of table.

TABLE 5.--LAND CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability	Corn	Soybeans	Wheat	Alfalfa hay	Grass-legume hay	Pasture
		Bu	Bu	Bu	Ton	Ton	AUM*
MeB-------------- Memphis	IIe	170	50	60	5.0	5.0	10.0
MeC2------------ Memphis	IIIe	140	40	50	4.5	4.5	9.0
MmF3**---------- Memphis-Molena	VIIe	---	---	---	---	---	---
Mo--------------- Mhoon	Vw	---	---	---	---	---	---
Op--------------- Openlake	IVw	150	40	---	---	---	---
Pt**------------- Pits-Dumps	VIIs	---	---	---	---	---	---
Rc**------------- Robinsonville-Crevasse	IVw	130	40	---	---	---	---
RnA**------------ Routon-Center	IIIw	120	35	30	---	3.5	7.0
RtA**------------ Routon-Center	IIIw	120	35	---	---	3.5	7.0

* Animal unit month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

** See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 6.--CAPABILITY CLASSES AND SUBCLASSES

(Dashes indicate no acreage)

Class	Total acreage	Major management concerns (Subclass)		
		Erosion (e)	Wetness (w)	Soil problem (s)
		Acres	Acres	Acres
I:				
Carlisle County	---	---	---	---
Hickman County	---	---	---	---
II:				
Carlisle County	52,010	28,840	27,170	---
Hickman County	69,290	33,010	36,280	---
III:				
Carlisle County	14,140	4,730	9,410	---
Hickman County	26,491	9,881	16,610	---
IV:				
Carlisle County	21,772	13,070	8,462	240
Hickman County	32,180	21,680	9,230	1,270
V:				
Carlisle County	2,340	---	2,340	---
Hickman County	2,800	---	2,800	---
VI:				
Carlisle County	14,950	14,950	---	---
Hickman County	17,170	17,170	---	---
VII:				
Carlisle County	16,900	16,760	---	140
Hickman County	8,940	8,920	---	20
VIII:				
Carlisle County	---	---	---	---
Hickman County	---	---	---	---

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY

(Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available)

Soil name and map symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Plant competition	Potential productivity: Common trees	Potential productivity: Site index	Potential productivity: Volume*	Trees to plant
Ad-------------- Adler	Slight	Moderate	Severe	Severe	Cherrybark oak--------	100	151	Yellow-poplar, eastern cottonwood, green ash, sweetgum, cherrybark oak, American sycamore.
					Eastern cottonwood----	120	186	
					Green ash-------------	95	74	
					Water oak-------------	100	98	
					Willow oak------------	95	92	
					Sweetgum--------------	96	125	
					American sycamore-----	110	157	
Bd-------------- Bardwell	Slight	Slight	Slight	Severe	Green ash-------------	---	---	Yellow-poplar, green ash, black walnut, sweetgum, pecan, cherrybark oak.
					Hackberry-------------	---	---	
					Silver maple----------	---	---	
					Boxelder--------------	---	---	
					Pecan-----------------	---	---	
					Sweetgum--------------	---	---	
					Kentucky coffee tree--	---	---	
					American elm----------	---	---	
Br**:								
Bowdre---------	Slight	Moderate	Severe	Severe	Eastern cottonwood----	108	135	Eastern cottonwood, sweetgum, American sycamore, green ash.
					Sweetgum--------------	99	135	
					Hackberry-------------	---	---	
					American elm----------	---	---	
					Boxelder--------------	---	---	
Robinsonville--	Slight	Moderate	Severe	Severe	Eastern cottonwood----	104	138	Eastern cottonwood, pecan, sweetgum, American sycamore, green ash.
					Silver maple----------	---	---	
					Boxelder--------------	---	---	
					American sycamore-----	---	---	
					Hackberry-------------	---	---	
CaA, CbA-------- Calloway	Slight	Moderate	Slight	Severe	Loblolly pine---------	83	116	Sweetgum, loblolly pine, yellow-poplar, cherrybark oak.
					Southern red oak------	83	65	
					Yellow-poplar---------	98	104	
					Hickory---------------	---	---	
					White oak-------------	---	---	
					Black oak-------------	---	---	
CeA------------- Center	Slight	Slight	Slight	Severe	Black cherry----------	---	---	Eastern cottonwood, sweetgum, American sycamore, cherrybark oak.
					American elm----------	---	---	
					Swamp white oak-------	---	---	
					Sweetgum--------------	90	106	
					Silver maple----------	---	---	
					Black gum-------------	---	---	
Cm-------------- Commerce	Slight	Moderate	Severe	Severe	Eastern cottonwood----	112	162	Eastern cottonwood, sweetgum, American sycamore, green ash.
					Sweetgum--------------	98	132	
					Silver maple----------	---	---	
					Black willow----------	---	---	
					Boxelder--------------	---	---	
					American elm----------	---	---	
					Hackberry-------------	---	---	

See footnotes at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Management concerns				Potential productivity			Trees to plant
	Erosion hazard	Equipment limitation	Seedling mortality	Plant competition	Common trees	Site index	Volume*	
Cn**:								
Convent	Slight	Moderate	Severe	Severe	Sweetgum	105	156	Eastern cottonwood, sweetgum, American sycamore, green ash.
					Willow oak	---	---	
					Pin oak	---	---	
					River birch	---	---	
					American sycamore	---	---	
					Green ash	---	---	
Adler	Slight	Moderate	Severe	Severe	Green ash	---	---	Eastern cottonwood, green ash, American sycamore, yellow-poplar, cherrybark oak.
					Pin oak	---	---	
					Willow oak	---	---	
					Sweetgum	105	156	
					American sycamore	---	---	
					River birch	---	---	
Ct**:								
Convent	Slight	Moderate	Severe	Severe	Sweetgum	105	156	Eastern cottonwood, sweetgum, American sycamore, green ash.
					Willow oak	---	---	
					Pin oak	---	---	
					River birch	---	---	
					American sycamore	---	---	
Mhoon	Slight	Moderate	Severe	Severe	Eastern cottonwood	102	133	Green ash, eastern cottonwood, American sycamore, sweetgum.
					Black willow	---	---	
					Silver maple	---	---	
Cv Crevasse	Slight	Moderate	Severe	Slight	Eastern cottonwood	86	93	Eastern cottonwood, sweetgum, green ash, loblolly pine.
					Red maple	---	---	
					Silver maple	---	---	
					American sycamore	---	---	
					Boxelder	---	---	
					Green ash	---	---	
De Dekoven	Slight	Moderate	Severe	Severe	Pin oak	---	---	Pin oak, sweetgum, American sycamore.
					Sweetgum	95	---	
					Green ash	---	---	
					Overcup oak	---	---	
					Swamp white oak	---	---	
					Shellbark hickory	---	---	
					Silver maple	---	---	
					American sycamore	---	---	
					Black willow	---	---	
Iu Iuka	Slight	Moderate	Moderate	Severe	Loblolly pine	100	---	Loblolly pine, eastern cottonwood, yellow-poplar.
					Sweetgum	100	---	
					Eastern cottonwood	105	---	
					Water oak	100	98	

See footnotes at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Management concerns				Potential productivity			Trees to plant
	Erosion hazard	Equipment limitation	Seedling mortality	Plant competition	Common trees	Site index	Volume*	
Kb**:								
Keyespoint-----	Slight	Moderate	Severe	Severe	Eastern cottonwood----	---	---	Eastern cottonwood,
					Boxelder-------------	---	---	green ash,
					Persimmon------------	---	---	American
					Sweetgum-------------	---	---	sycamore,
					American elm----------	---	---	sweetgum,
					American sycamore-----	---	---	pecan,
					Hackberry------------	---	---	cherrybark
					Pecan----------------	---	---	oak.
Bardwell-------	Slight	Slight	Slight	Severe	Green ash------------	---	---	Yellow-poplar,
					Hackberry------------	---	---	green ash,
					Silver maple----------	---	---	black walnut,
					Boxelder-------------	---	---	sweetgum,
					Pecan----------------	---	---	pecan,
					Kentucky coffee tree--	---	---	cherrybark
					American elm----------	---	---	oak.
					Sweetgum-------------	---	---	
LoB, LoB3------- Loring	Slight	Slight	Slight	Severe	Yellow-poplar---------	86	82	Yellow-poplar,
					Black oak------------	63	46	white oak,
					Southern red oak------	62	45	loblolly pine,
					Sweetgum-------------	---	---	eastern white
					Loblolly pine---------	87	125	pine.
					Virginia pine---------	75	115	
					White oak------------	62	45	
					Hickory--------------	---	---	
					Scarlet oak-----------	70	52	
					Shortleaf pine--------	62	92	
LoC2, LoC3------ Loring	Slight	Slight	Slight	Severe	Southern red oak------	62	45	Yellow-poplar,
					Sweetgum-------------	---	---	white oak,
					Loblolly pine---------	87	125	loblolly pine,
					Yellow-poplar---------	86	82	eastern white
					Black oak------------	63	46	pine.
					Virginia pine---------	75	115	
					White oak------------	62	45	
					Hickory--------------	---	---	
					Scarlet oak-----------	70	52	
					Shortleaf pine--------	62	92	
LoD3------------ Loring	Moderate	Moderate	Slight	Severe	Southern red oak------	62	45	Yellow-poplar,
					Sweetgum-------------	---	---	white oak,
					Loblolly pine---------	87	125	loblolly pine,
					Yellow-poplar---------	86	82	eastern white
					Black oak------------	63	46	pine.
					Virginia pine---------	75	115	
					White oak------------	62	45	
					Hickory--------------	---	---	
					Scarlet oak-----------	70	52	
					Shortleaf pine--------	62	92	

See footnotes at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Plant competition	Potential productivity: Common trees	Site index	Volume*	Trees to plant
LsE3**:								
Loring	Moderate	Moderate	Slight	Severe	Southern red oak	62	45	Yellow-poplar, white oak, loblolly pine, eastern white pine.
					Sweetgum	---	---	
					Loblolly pine	87	125	
					Yellow-poplar	86	82	
					Black oak	63	46	
					Virginia pine	75	115	
					White oak	62	45	
					Hickory	---	---	
					Scarlet oak	70	52	
					Shortleaf pine	62	92	
Memphis	Moderate	Moderate	Moderate	Severe	Yellow-poplar	98	104	Yellow-poplar, loblolly pine, sweetgum, black walnut, white ash, white oak.
					Shortleaf pine	75	120	
					Loblolly pine	79	108	
					White oak	76	58	
					Northern red oak	90	72	
					Black oak	88	70	
Saffell	Moderate	Moderate	Moderate	Moderate	Black oak	50	34	White oak, loblolly pine, shortleaf pine.
					White oak	55	38	
					Chestnut oak	47	32	
					Scarlet oak	56	39	
MeB, MeC2: Memphis	Slight	Slight	Slight	Severe	Yellow-poplar	98	104	Yellow-poplar, loblolly pine, sweetgum, black walnut, white ash, white oak.
					Shortleaf pine	75	120	
					Loblolly pine	79	108	
					White oak	76	58	
					Northern red oak	90	72	
					Black oak	88	70	
MmF3**:								
Memphis	Severe	Severe	Moderate	Severe	Yellow-poplar	98	104	Yellow-poplar, loblolly pine, sweetgum, black walnut, white ash, white oak.
					Shortleaf pine	75	120	
					Loblolly pine	79	108	
					White oak	76	58	
					Northern red oak	90	72	
					Black oak	88	70	
Molena	Severe	Severe	Moderate	Moderate	Sweetgum	---	---	Sweetgum, green ash, American sycamore, loblolly pine, shortleaf pine.
					White oak	---	---	
					Northern red oak	---	---	
					Sugar maple	---	---	
					Black locust	---	---	
					American basswood	---	---	
					Southern red oak	---	---	
					Hickory	---	---	
Mo: Mhoon	Slight	Moderate	Moderate	Severe	Black willow	---	---	Green ash, eastern cottonwood, sweetgum, American sycamore.
					Silver maple	---	---	

See footnotes at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Management concerns				Potential productivity			Trees to plant
	Erosion hazard	Equipment limitation	Seedling mortality	Plant competition	Common trees	Site index	Volume*	
Op------------- Openlake	Slight	Moderate	Moderate	Moderate	Sweetgum------------- Green ash------------ American sycamore----- Pecan---------------- Hackberry------------ Silver maple---------- American elm---------- Boxelder-------------	--- --- --- --- --- --- --- ---	--- --- --- --- --- --- --- ---	Eastern cottonwood, American sycamore, sweetgum, green ash, loblolly pine.
Rc**: Robinsonville--	Slight	Moderate	Severe	Severe	Eastern cottonwood---- American sycamore----- Silver maple---------- Boxelder------------- Hackberry------------	104 --- --- --- ---	138 --- --- --- ---	Eastern cottonwood, sweetgum, American sycamore, pecan, green ash.
Crevasse-------	Slight	Moderate	Severe	Slight	Eastern cottonwood---- Red maple------------ Silver maple---------- American sycamore----- Boxelder------------- Green ash------------	86 --- --- --- --- ---	93 --- --- --- --- ---	Eastern cottonwood, sweetgum, green ash, loblolly pine.
RnA**, RtA**: Routon---------	Slight	Moderate	Moderate	Severe	Cherrybark oak-------- Willow oak----------- Sweetgum------------- Pin oak-------------- Swamp white oak-------	104 --- 87 --- 90	--- --- --- --- ---	Cherrybark oak, eastern cottonwood, sweetgum, willow oak, green ash.
Center---------	Slight	Slight	Slight	Severe	Sweetgum------------- American elm---------- Silver maple---------- Blackgum------------- Swamp white oak-------	--- --- --- --- ---	--- --- --- --- ---	Eastern cottonwood, sweetgum, green ash, cherrybark oak.

* Volume is the yield in cubic feet per acre per year calculated at the age of culmination of mean annual increment for fully stocked natural stands.

** See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 8.--RECREATIONAL DEVELOPMENT

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated)

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
Ad: Adler	Severe: flooding.	Moderate: flooding, wetness.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
Bd: Bardwell	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
Br*:					
Bowdre	Severe: flooding.	Moderate: flooding, wetness.	Severe: flooding.	Moderate: wetness.	Severe: flooding.
Robinsonville	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
CaA: Calloway	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
CbA: Calloway	Severe: flooding, wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
CeA: Center	Severe: flooding, wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
Cm: Commerce	Severe: flooding.	Moderate: flooding, wetness, percs slowly.	Severe: flooding.	Moderate: wetness, flooding.	Severe: flooding.
Cn*:					
Convent	Severe: flooding.	Moderate: flooding, wetness.	Severe: flooding.	Moderate: wetness, flooding.	Severe: flooding.
Adler	Severe: flooding.	Moderate: flooding, wetness.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
Ct*:					
Convent	Severe: flooding.	Moderate: flooding, wetness.	Severe: flooding.	Moderate: wetness, flooding.	Severe: flooding.
Mhoon	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.	Severe: wetness, flooding.
Cv: Crevasse	Severe: flooding, too sandy.	Severe: too sandy.	Severe: too sandy, flooding.	Severe: too sandy.	Severe: droughty, flooding.
De: Dekoven	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.

See footnote at end of table.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
Iu------------------ Iuka	Severe: flooding, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, flooding.
Kb*:					
Keyespoint-----------	Severe: flooding, percs slowly.	Severe: percs slowly.	Severe: flooding, percs slowly.	Moderate: flooding.	Severe: flooding.
Bardwell-------------	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
LoB, LoB3------------ Loring	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Slight----------	Slight.
LoC2, LoC3----------- Loring	Moderate: slope, wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
LoD3----------------- Loring	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
LsE3*:					
Loring---------------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
Memphis--------------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
Saffell--------------	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Moderate: slope.	Severe: slope, small stones.
MeB------------------ Memphis	Slight---------	Slight---------	Moderate: slope.	Slight----------	Slight.
MeC2----------------- Memphis	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
MmF3*:					
Memphis--------------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
Molena---------------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Mo------------------- Mhoon	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness, ponding.	Severe: wetness, flooding, ponding.
Op------------------- Openlake	Severe: flooding, percs slowly, too clayey.	Severe: too clayey, percs slowly.	Severe: too clayey, flooding, percs slowly.	Severe: too clayey.	Severe: flooding, too clayey.

See footnote at end of table.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
Pt*:					
Pits.					
Dumps.					
Rc*:					
Robinsonville--------	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
Crevasse-------------	Severe: flooding, too sandy.	Severe: too sandy.	Severe: too sandy, flooding.	Severe: too sandy.	Severe: droughty, flooding.
RnA*:					
Routon---------------	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Center---------------	Severe: flooding, wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
RtA*:					
Routon---------------	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Center---------------	Severe: flooding, wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, flooding.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--WILDLIFE HABITAT

(See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated)

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
Ad------------------ Adler	Poor	Fair	Fair	Good	Good	Poor	Poor	Fair	Good	Poor.
Bd------------------ Bardwell	Poor	Fair	Fair	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
Br*:										
Bowdre------------	Poor	Fair	Fair	Good	Good	Fair	Fair	Fair	Good	Fair.
Robinsonville-----	Poor	Fair	Fair	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
CaA, CbA----------- Calloway	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
CeA---------------- Center	Fair	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Cm----------------- Commerce	Poor	Fair	Fair	Good	Good	Fair	Fair	Fair	Good	Fair.
Cn*:										
Convent-----------	Poor	Fair	Fair	Good	Good	Fair	Fair	Fair	Good	Fair.
Adler-------------	Poor	Fair	Fair	Good	Good	Poor	Poor	Fair	Good	Poor.
Ct*:										
Convent-----------	Poor	Fair	Fair	Good	Good	Fair	Fair	Fair	Good	Fair.
Mhoon-------------	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
Cv----------------- Crevasse	Poor	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.
De----------------- Dekoven	Poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Fair	Good.
Iu----------------- Iuka	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Kb*:										
Keyespoint--------	Poor	Fair	Fair	Good	Good	Fair	Fair	Fair	Good	Fair.
Bardwell----------	Poor	Fair	Fair	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
LoB, LoB3---------- Loring	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
LoC2, LoC3--------- Loring	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
LoD3--------------- Loring	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.

See footnote at end of table.

TABLE 9.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
LsE3*:										
Loring	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Memphis	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Saffell	Very poor.	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
MeB Memphis	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
MeC2 Memphis	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
MmF3*:										
Memphis	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Molena	Very poor.	Poor	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Mo Mhoon	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Good	Good	Very poor.	Very poor.	Good.
Op Openlake	Poor	Fair	Fair	Good	Good	Poor	Fair	Fair	Good	Poor.
Pt*:										
Pits.										
Dumps.										
Rc*:										
Robinsonville	Poor	Fair	Fair	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
Crevasse	Poor	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.
RnA*, RtA*:										
Routon	Poor	Fair	Fair	Fair	Fair	Good	Fair	Fair	Fair	Fair.
Center	Fair	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--BUILDING SITE DEVELOPMENT

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
Ad: Adler	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding, low strength.	Severe: flooding.
Bd: Bardwell	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding, low strength.	Severe: flooding.
Br*:						
Bowdre	Severe: cutbanks cave, wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding.	Severe: flooding.
Robinsonville	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
CaA: Calloway	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength.	Moderate: wetness.
CbA: Calloway	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength.	Moderate: wetness.
CeA: Center	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength.	Moderate: wetness.
Cm: Commerce	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: low strength, flooding.	Severe: flooding.
Cn*:						
Convent	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding, low strength.	Severe: flooding.
Adler	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding, low strength.	Severe: flooding.
Ct*:						
Convent	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding, low strength.	Severe: flooding.
Mhoon	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.	Severe: wetness, flooding.
Cv: Crevasse	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: droughty, flooding.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
De---------------- Dekoven	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.	Severe: wetness.
Iu---------------- Iuka	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding.	Moderate: wetness, flooding.
Kb*:						
Keyespoint--------	Severe: wetness.	Severe: flooding, shrink-swell.	Severe: flooding, wetness.	Severe: flooding, shrink-swell.	Severe: shrink-swell, low strength, flooding.	Severe: flooding.
Bardwell----------	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding, low strength.	Severe: flooding.
LoB--------------- Loring	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness, slope.	Severe: low strength.	Slight.
LoB3-------------- Loring	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness, slope.	Severe: low strength.	Slight.
LoC2, LoC3-------- Loring	Severe: wetness.	Moderate: wetness, slope.	Severe: wetness.	Severe: slope.	Severe: low strength.	Moderate: slope.
LoD3-------------- Loring	Severe: wetness, slope.	Severe: slope.	Severe: wetness, slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
LsE3*:						
Loring-----------	Severe: wetness, slope.	Severe: slope.	Severe: wetness, slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
Memphis----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
Saffell----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, small stones.
MeB--------------- Memphis	Slight----------	Slight----------	Slight----------	Moderate: slope.	Severe: low strength.	Slight.
MeC2-------------- Memphis	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: low strength.	Moderate: slope.
MmF3*:						
Memphis----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
MmF3*:						
Molena	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Mo: Mhoon	Severe: wetness.	Severe: flooding, wetness, ponding.	Severe: flooding, wetness, ponding.	Severe: flooding, wetness, ponding.	Severe: low strength, ponding, flooding.	Severe: wetness, flooding, ponding.
Op: Openlake	Severe: wetness.	Severe: flooding, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, shrink-swell.	Severe: shrink-swell, low strength, flooding.	Severe: flooding, too clayey.
Pt*:						
Pits.						
Dumps.						
Rc*:						
Robinsonville	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
Crevasse	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: droughty, flooding.
RnA*:						
Routon	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness.	Severe: wetness.
Center	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength.	Moderate: wetness.
RtA*:						
Routon	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.	Severe: wetness.
Center	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, flooding.	Moderate: wetness, flooding.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--SANITARY FACILITIES

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "good," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Ad: Adler	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: wetness.
Bd: Bardwell	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: too clayey, wetness.
Br*:					
Bowdre	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding.	Fair: wetness.
Robinsonville	Severe: flooding.	Severe: seepage, flooding.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage.	Good.
CaA, CbA: Calloway	Severe: wetness, percs slowly.	Slight	Severe: wetness.	Severe: wetness.	Poor: wetness.
CeA: Center	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Cm: Commerce	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: thin layer.
Cn*:					
Convent	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: wetness.
Adler	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: wetness.
Ct*:					
Convent	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: wetness.
Mhoon	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
Cv: Crevasse	Severe: flooding, wetness, poor filter.	Severe: seepage, flooding.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage.	Poor: seepage, too sandy.

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
De: Dekoven	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
Iu: Iuka	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: wetness.
Kb*:					
Keyespoint	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, seepage, wetness.	Severe: flooding, wetness.	Fair: wetness.
Bardwell	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: too clayey, wetness.
LoB, LoB3: Loring	Severe: wetness, percs slowly.	Moderate: slope.	Moderate: wetness.	Moderate: wetness.	Fair: wetness.
LoC2, LoC3: Loring	Severe: wetness, percs slowly.	Severe: slope.	Moderate: wetness, slope.	Moderate: wetness, slope.	Moderate: wetness, slope.
LoD3: Loring	Severe: wetness, percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
LsE3*:					
Loring	Severe: wetness, percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Memphis	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Saffell	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: slope, seepage.	Poor: small stones, slope.
MeB: Memphis	Slight	Moderate: seepage, slope.	Slight	Slight	Good.
MeC2: Memphis	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
MmF3*:					
Memphis	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Molena	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: slope.

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Mo------------------ Mhoon	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness, ponding.	Severe: flooding, wetness, ponding.	Poor: wetness, ponding.
Op------------------ Openlake	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack.
Pt*:					
Pits.					
Dumps.					
Rc*:					
Robinsonville------	Severe: flooding.	Severe: seepage, flooding.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage.	Good.
Crevasse-----------	Severe: flooding, wetness, poor filter.	Severe: seepage, flooding.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage.	Poor: seepage, too sandy.
RnA*:					
Routon-------------	Severe: wetness, percs slowly.	Moderate: seepage.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Center-------------	Severe: wetness, percs slowly.	Severe: wetness, flooding.	Severe: wetness.	Severe: wetness.	Poor: wetness.
RtA*:					
Routon-------------	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
Center-------------	Severe: flooding, wetness, percs slowly.	Severe: wetness, flooding.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--CONSTRUCTION MATERIALS

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Ad-------------------- Adler	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Bd-------------------- Bardwell	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Br*:				
Bowdre---------------	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Robinsonville--------	Good-----------------	Improbable: excess fines.	Improbable: excess fines.	Good.
CaA, CbA-------------- Calloway	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
CeA------------------- Center	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Cm-------------------- Commerce	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Cn*:				
Convent--------------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Adler----------------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Ct*:				
Convent--------------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Mhoon----------------	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Cv-------------------- Crevasse	Good-----------------	Probable-------------	Improbable: too sandy.	Poor: too sandy.
De-------------------- Dekoven	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Iu-------------------- Iuka	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
Kb*:				
Keyespoint-----------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Bardwell-------------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
LoB, LoB3: Loring	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
LoC2, LoC3: Loring	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
LoD3: Loring	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
LsE3*:				
Loring	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Memphis	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Saffell	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
MeB: Memphis	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
MeC2: Memphis	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
MmF3*:				
Memphis	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Molena	Poor: slope.	Probable	Improbable: too sandy.	Poor: slope.
Mo: Mhoon	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Op: Openlake	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Pt*:				
Pits.				
Dumps.				
Rc*:				
Robinsonville	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
Crevasse	Good	Probable	Improbable: too sandy.	Poor: too sandy.
RnA*, RtA*:				
Routon	Poor: wetness, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
RnA*, RtA*:				
Center----------------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--WATER MANAGEMENT

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Limitations for-- Pond reservoir areas	Limitations for-- Embankments, dikes, and levees	Features affecting-- Drainage	Features affecting-- Terraces and diversions	Features affecting-- Grassed waterways
Ad: Adler	Moderate: seepage.	Severe: piping.	Flooding	Erodes easily, wetness.	Erodes easily.
Bd: Bardwell	Moderate: seepage.	Severe: piping.	Deep to water	Favorable	Favorable.
Br*:					
Bowdre	Moderate: seepage.	Severe: piping.	Percs slowly, flooding.	Erodes easily, wetness.	Erodes easily, percs slowly.
Robinsonville	Severe: seepage.	Severe: piping.	Deep to water	Favorable	Favorable.
CaA, CbA: Calloway	Moderate: seepage.	Moderate: piping, wetness.	Percs slowly	Erodes easily, wetness, rooting depth.	Wetness, erodes easily, rooting depth.
CeA: Center	Slight	Severe: piping, wetness.	Favorable	Erodes easily, wetness.	Wetness, erodes easily.
Cm: Commerce	Moderate: seepage.	Severe: wetness.	Flooding	Wetness	Favorable.
Cn*:					
Convent	Moderate: seepage.	Severe: piping, wetness.	Flooding	Erodes easily, wetness.	Erodes easily.
Adler	Moderate: seepage.	Severe: piping.	Flooding	Erodes easily, wetness.	Erodes easily.
Ct*:					
Convent	Moderate: seepage.	Severe: piping, wetness.	Flooding	Erodes easily, wetness.	Erodes easily.
Mhoon	Slight	Severe: wetness.	Percs slowly, flooding.	Erodes easily, wetness.	Wetness, erodes easily, percs slowly.
Cv: Crevasse	Severe: seepage.	Severe: seepage, piping.	Deep to water	Too sandy	Droughty.
De: Dekoven	Moderate: seepage.	Severe: piping, wetness.	Flooding	Erodes easily, wetness.	Wetness, erodes easily.
Iu: Iuka	Moderate: seepage.	Severe: piping, wetness.	Flooding	Wetness	Wetness.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Terraces and diversions	Grassed waterways
Kb*:					
Keyespoint	Severe: seepage.	Severe: piping.	Percs slowly, flooding.	Wetness	Percs slowly.
Bardwell	Moderate: seepage.	Severe: piping.	Deep to water	Favorable	Favorable.
LoB, LoB3 Loring	Moderate: seepage, slope.	Moderate: piping, wetness.	Slope, percs slowly.	Erodes easily, wetness, rooting depth.	Erodes easily, rooting depth.
LoC2, LoC3, LoD3 Loring	Severe: slope.	Moderate: piping, wetness.	Slope, percs slowly.	Slope, erodes easily, wetness.	Slope, erodes easily, rooting depth.
LsE3*:					
Loring	Severe: slope.	Moderate: piping, wetness.	Slope, percs slowly.	Slope, erodes easily, wetness.	Slope, erodes easily, rooting depth.
Memphis	Severe: slope.	Severe: piping.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
Saffell	Severe: slope, seepage.	Severe: seepage.	Deep to water	Slope	Slope, droughty.
MeB Memphis	Moderate: seepage, slope.	Severe: piping.	Deep to water	Erodes easily	Erodes easily.
MeC2 Memphis	Severe: slope.	Severe: piping.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
MmF3*:					
Memphis	Severe: slope.	Severe: piping.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
Molena	Severe: seepage, slope.	Severe: seepage, piping.	Deep to water	Slope, too sandy, soil blowing.	Slope, droughty.
Mo Mhoon	Slight	Severe: wetness.	Percs slowly, flooding.	Erodes easily, wetness, ponding.	Wetness, erodes easily, percs slowly.
Op Openlake	Slight	Severe: hard to pack, wetness.	Percs slowly, flooding.	Wetness, percs slowly.	Percs slowly.
Pt*:					
Pits.					
Dumps.					
Rc*:					
Robinsonville	Severe: seepage.	Severe: piping.	Deep to water	Favorable	Favorable.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Terraces and diversions	Grassed waterways
Rc*:					
Crevasse	Severe: seepage.	Severe: seepage, piping.	Deep to water	Too sandy	Droughty.
RnA*:					
Routon	Slight	Severe: piping, wetness.	Percs slowly	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
Center	Slight	Severe: piping, wetness.	Favorable	Erodes easily, wetness.	Wetness, erodes easily.
RtA*:					
Routon	Slight	Severe: piping, wetness.	Percs slowly, flooding.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
Center	Slight	Severe: piping, wetness.	Flooding	Erodes easily, wetness.	Wetness, erodes easily.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--ENGINEERING INDEX PROPERTIES

(The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated)

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments >3 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
Ad---------------- Adler	0-11	Silt loam--------	ML, CL-ML	A-4	0	100	100	100	95-100	<28	NP-7
	11-38	Silt loam, silt	ML, CL, CL-ML	A-4	0	100	100	95-100	85-100	<30	NP-10
	38-60	Silt loam, very fine sandy loam.	ML, CL, CL-ML	A-4	0	100	100	95-100	60-95	<30	NP-10
Bd---------------- Bardwell	0-17	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	95-100	95-100	85-100	60-95	25-40	4-15
	17-49	Silt loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6	0	95-100	95-100	85-100	60-95	25-40	4-15
	49-60	Stratified fine sand to silty clay loam.	SM, SC, ML, CL	A-2, A-4	0-10	95-100	60-100	50-90	30-75	<30	NP-10
Br*:											
Bowdre-----------	0-16	Silty clay loam, silty clay.	CH	A-7	0	100	100	95-100	90-95	51-65	28-40
	16-60	Silt loam, loam, fine sandy loam.	SC, CL, CL-ML, SC-SM	A-2, A-4	0	100	100	60-100	30-90	20-30	3-10
Robinsonville---	0-8	Silt loam--------	SM, ML	A-4	0	100	95-100	85-95	35-80	<25	NP-3
	8-60	Stratified fine sandy loam to silt loam.	SM, ML	A-2, A-4	0	100	95-100	75-95	30-65	<25	NP-3
CaA, CbA--------- Calloway	0-19	Silt loam--------	CL-ML, ML, CL	A-4, A-6	0	100	100	100	90-100	25-35	5-15
	19-48	Silt loam, silty clay loam.	CL	A-6	0	100	100	100	90-100	30-40	12-20
	48-60	Silt loam, silty clay loam.	CL-ML, CL	A-4, A-6	0	100	100	100	90-100	25-35	5-15
CeA--------------- Center	0-6	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	100	95-100	90-100	80-100	<30	3-11
	6-37	Silty clay loam, silt loam.	CL, ML	A-6, A-4	0	100	95-100	95-100	90-100	28-40	8-16
	37-60	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	100	95-100	90-100	80-100	<30	3-11
Cm---------------- Commerce	0-5	Silt loam--------	CL-ML, CL, ML	A-4	0	100	100	100	75-100	<30	NP-10
	5-48	Silty clay loam, silt loam, loam.	CL	A-6, A-7-6	0	100	100	100	85-100	32-45	11-23
	48-60	Stratified very fine sandy loam to silty clay.	CL-ML, CL, ML	A-4, A-6, A-7-6	0	100	100	100	75-100	23-45	3-23
Cn*:											
Convent----------	0-18	Silt loam--------	ML, CL-ML	A-4	0	100	100	95-100	85-100	<27	NP-7
	18-60	Silt loam, very fine sandy loam, loam.	ML, CL-ML	A-4	0	100	100	95-100	75-100	<27	NP-7

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments >3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
Cn*:											
Adler	0-11	Silt loam	ML, CL-ML	A-4	0	100	100	100	95-100	<28	NP-7
	11-38	Silt loam, silt	ML, CL, CL-ML	A-4	0	100	100	95-100	85-100	<30	NP-10
	38-60	Silt loam, very fine sandy loam.	ML, CL, CL-ML	A-4	0	100	100	95-100	60-95	<30	NP-10
Ct*:											
Convent	0-18	Silt loam	ML, CL-ML	A-4	0	100	100	95-100	85-100	<27	NP-7
	18-60	Silt loam, fine sandy loam, loam.	ML, CL-ML	A-4	0	100	100	95-100	75-100	<27	NP-7
Mhoon	0-10	Silt loam	ML, CL-ML, CL	A-4	0	100	100	100	95-100	22-30	3-10
	10-60	Silty clay loam, silt loam, clay loam.	CL, CH	A-6, A-7-6	0	100	100	100	95-100	30-55	11-28
Cv Crevasse	0-13	Sand	SP-SM, SM	A-2-4, A-3	0	100	95-100	50-100	5-20	---	NP
	13-60	Sand, loamy sand, loamy fine sand.	SP-SM, SM	A-2, A-3	0	100	95-100	50-100	5-20	---	NP
De Dekoven	0-26	Silt loam	ML, CL, CL-ML	A-4, A-6	0	100	95-100	90-100	85-100	25-40	5-20
	26-60	Silty clay loam, silt loam.	ML, CL, CL-ML	A-4, A-6, A-7	0	100	95-100	90-100	85-100	25-45	5-20
Iu Iuka	0-4	Sandy loam	SM, SC-SM, ML, CL-ML	A-4, A-2	0	95-100	80-100	70-100	30-60	<20	NP-7
	4-20	Fine sandy loam, gravelly loam, loam.	SM, SC-SM, ML, CL-ML	A-4	0	95-100	70-100	65-100	36-75	<30	NP-7
	20-60	Sandy loam, fine sandy loam, silt loam.	SM, ML	A-2, A-4	0	95-100	70-100	70-100	25-60	<30	NP-7
Kb*:											
Keyespoint	0-6	Silty clay loam	CL, CH	A-7, A-6	0	100	100	95-100	85-100	38-55	20-33
	6-28	Clay, silty clay	CH	A-7	0	100	100	95-100	90-100	50-80	28-50
	28-60	Very fine sandy loam.	SM	A-2, A-4	0	100	95-100	50-85	15-40	---	NP
Bardwell	0-17	Silt loam	ML, CL, CL-ML	A-4, A-6	0	95-100	95-100	85-100	60-95	25-40	4-15
	17-49	Silt loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6	0	95-100	95-100	85-100	60-95	25-40	4-15
	49-60	Stratified fine sand to silty clay loam.	SM, SC, ML, CL	A-2, A-4	0-10	95-100	60-100	50-90	30-75	<30	NP-10
LoB, LoC2 Loring	0-8	Silt loam	ML, CL-ML, CL	A-4, A-6	0	100	100	95-100	90-100	<35	NP-15
	8-27	Silt loam, silty clay loam.	CL, ML	A-6, A-7, A-4	0	100	100	95-100	90-100	32-48	10-20
	27-60	Silt loam, silty clay loam.	CL, ML	A-4, A-6, A-7	0	100	100	95-100	90-100	30-45	10-22

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments >3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
LoB3, LoC3, LoD3: Loring	0-7	Silt loam	ML, CL-ML, CL	A-4, A-6	0	100	100	95-100	90-100	<35	NP-15
	7-14	Silt loam, silty clay loam.	CL, ML	A-6, A-7, A-4	0	100	100	95-100	90-100	32-48	10-20
	14-60	Silt loam, silty clay loam.	CL, ML	A-4, A-6, A-7	0	100	100	95-100	90-100	30-45	10-22
LsE3*: Loring	0-7	Silt loam	ML, CL-ML, CL	A-4, A-6	0	100	100	95-100	90-100	<35	NP-15
	7-14	Silt loam, silty clay loam.	CL, ML	A-6, A-7, A-4	0	100	100	95-100	90-100	32-48	10-20
	14-60	Silt loam, silty clay loam.	CL, ML	A-4, A-6, A-7	0	100	100	95-100	90-100	30-45	10-22
Memphis	0-6	Silt loam	ML, CL-ML, CL	A-4	0	100	100	100	90-100	<30	NP-10
	6-29	Silt loam, silty clay loam.	CL	A-6, A-7	0	100	100	100	90-100	35-48	15-26
	29-60	Silt loam	ML, CL	A-4, A-6	0	100	100	100	90-100	30-40	6-18
Saffell	0-4	Very gravelly loam.	SM, ML, SC-SM, CL-ML	A-2, A-4	0	75-100	45-50	40-45	25-45	<25	NP-7
	4-11	Very gravelly fine sandy loam, very gravelly silt loam, gravelly loam.	SM, SC-SM, ML, GM	A-2, A-1, A-4	0-10	30-75	25-75	20-70	12-50	<25	NP-7
	11-48	Very gravelly clay loam, very gravelly sandy loam, very gravelly loam.	GC, SC, SC-SM, GM-GC	A-2, A-1, A-4, A-6	0-10	35-85	25-55	20-50	12-40	20-40	4-15
	48-60	Gravelly sandy loam, very gravelly sandy loam, gravelly loamy sand.	GM, GC, SM, SC	A-1, A-2	0-15	25-80	10-75	10-65	5-35	<30	3-10
MeB: Memphis	0-9	Silt loam	ML, CL-ML, CL	A-4	0	100	100	100	90-100	<30	NP-10
	9-32	Silt loam, silty clay loam.	CL	A-6, A-7	0	100	100	100	90-100	35-48	15-26
	32-60	Silt loam	ML, CL	A-4, A-6	0	100	100	100	90-100	30-42	6-18
MeC2: Memphis	0-6	Silt loam	ML, CL-ML, CL	A-4	0	100	100	100	90-100	<30	NP-10
	6-29	Silt loam, silty clay loam.	CL	A-6, A-7	0	100	100	100	90-100	35-48	15-26
	29-60	Silt loam	ML, CL	A-4, A-6	0	100	100	100	90-100	30-42	6-18

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments >3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
MmF3*:											
Memphis----------	0-6	Silt loam--------	ML, CL-ML, CL	A-4	0	100	100	100	90-100	<30	NP-10
	6-29	Silt loam, silty clay loam.	CL	A-6, A-7	0	100	100	100	90-100	35-48	15-25
	29-60	Silt loam--------	ML, CL	A-4, A-6	0	100	100	100	90-100	30-40	6-15
Molena-----------	0-6	Loamy sand-------	SM, SP-SM	A-2, A-3	0	100	98-100	55-95	5-15	---	NP
	6-60	Loamy fine sand, loamy sand.	SM, SP-SM	A-2, A-3	0	100	98-100	55-95	7-25	---	NP
Mo--------------- Mhoon	0-10	Silt loam--------	ML, CL-ML, CL	A-4	0	100	100	100	95-100	22-30	3-10
	10-60	Silty clay loam, silt loam, clay loam.	CL, CH	A-6, A-7-6	0	100	100	100	95-100	30-55	11-28
Op--------------- Openlake	0-8	Silty clay-------	CH	A-7	0	100	100	95-100	90-100	55-80	33-50
	8-65	Silty clay, clay, silty clay loam.	CH, MH	A-7	0	100	100	95-100	90-100	55-80	27-50
Pt*:											
Pits.											
Dumps.											
Rc*:											
Robinsonville----	0-8	Silt loam--------	SM, ML	A-4	0	100	95-100	85-95	35-80	<25	NP-3
	8-60	Stratified fine sandy loam to silt loam.	SM, ML	A-2, A-4	0	100	95-100	75-95	30-65	<25	NP-3
Crevasse---------	0-13	Sand-------------	SP-SM, SM	A-2-4, A-3	0	100	95-100	50-100	5-20	---	NP
	13-60	Sand, loamy sand, fine sand.	SP-SM, SM	A-2, A-3	0	100	95-100	50-100	5-20	---	NP
RnA*, RtA*:											
Routon-----------	0-10	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	100	100	90-100	85-95	16-32	3-12
	10-60	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	100	100	90-100	90-95	20-40	5-17
Center-----------	0-6	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	100	95-100	90-100	80-100	<30	3-11
	6-37	Silty clay loam, silt loam.	CL, ML	A-6, A-4	0	100	95-100	95-100	90-100	28-40	8-16
	37-60	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	100	95-100	90-100	80-100	<30	3-11

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

(The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated)

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH				Pct
Ad----------------	0-11	10-25	1.50-1.55	0.6-2.0	0.20-0.23	4.5-7.8	Low-----------	0.43	5	1.5-4
Adler	11-38	5-18	1.50-1.55	0.6-2.0	0.20-0.23	4.5-7.8	Low-----------	0.43		
	38-60	5-23	1.50-1.55	0.6-2.0	0.20-0.23	4.5-7.8	Low-----------	0.43		
Bd----------------	0-17	8-30	1.10-1.30	0.6-2.0	0.18-0.24	5.6-7.8	Low-----------	0.28	5	4-6
Bardwell	17-49	18-30	1.30-1.50	0.6-2.0	0.16-0.22	5.6-7.8	Low-----------	0.32		
	49-60	8-30	1.30-1.50	0.6-2.0	0.10-0.16	5.6-7.8	Low-----------	0.28		
Br*:										
Bowdre-----------	0-16	35-60	1.40-1.50	0.06-0.2	0.15-0.20	6.1-8.4	High----------	0.37	3	2-3
	16-60	7-25	1.50-1.55	0.6-2.0	0.15-0.22	6.1-8.4	Low-----------	0.32		
Robinsonville---	0-8	5-15	1.40-1.50	2.0-6.0	0.15-0.22	6.1-8.4	Low-----------	0.32	5	.5-2
	8-60	5-15	1.50-1.60	0.6-6.0	0.14-0.18	6.1-8.4	Low-----------	0.32		
CaA, CbA----------	0-19	18-27	1.40-1.55	0.6-2.0	0.20-0.23	4.5-6.0	Low-----------	0.49	3	.5-2
Calloway	19-48	10-32	1.35-1.55	0.06-0.2	0.09-0.12	4.5-6.0	Low-----------	0.43		
	48-60	14-32	1.45-1.55	0.06-0.2	0.09-0.12	5.1-7.8	Low-----------	0.43		
CeA---------------	0-6	12-27	1.35-1.50	0.6-2.0	0.18-0.22	5.1-6.5	Low-----------	0.49	5	2-3
Center	6-37	18-32	1.30-1.50	0.2-0.6	0.16-0.20	5.1-6.5	Low-----------	0.43		
	37-60	15-32	1.30-1.50	0.2-0.6	0.16-0.20	5.6-7.8	Low-----------	0.49		
Cm----------------	0-5	14-27	1.35-1.65	0.6-2.0	0.21-0.23	6.1-7.8	Low-----------	0.43	5	4-5
Commerce	5-48	14-35	1.35-1.65	0.2-0.6	0.20-0.22	6.1-7.8	Moderate------	0.32		
	48-60	14-39	1.35-1.65	0.2-2.0	0.20-0.23	6.6-8.4	Low-----------	0.37		
Cn*:										
Convent----------	0-18	5-18	1.30-1.65	0.6-2.0	0.18-0.23	5.6-8.4	Low-----------	0.43	5	2-4
	18-60	5-18	1.30-1.65	0.6-2.0	0.20-0.23	5.6-8.4	Low-----------	0.37		
Adler------------	0-11	10-25	1.50-1.55	0.6-2.0	0.20-0.23	4.5-7.8	Low-----------	0.43	5	1.5-4
	11-38	5-18	1.50-1.55	0.6-2.0	0.20-0.23	4.5-7.8	Low-----------	0.43		
	38-60	5-23	1.50-1.55	0.6-2.0	0.20-0.23	4.5-7.8	Low-----------	0.43		
Ct*:										
Convent----------	0-18	5-18	1.30-1.65	0.6-2.0	0.18-0.23	5.6-8.4	Low-----------	0.43	5	2-4
	18-60	5-18	1.30-1.65	0.6-2.0	0.20-0.23	5.6-8.4	Low-----------	0.37		
Mhoon------------	0-10	14-27	1.35-1.65	0.6-2.0	0.21-0.23	6.1-7.8	Low-----------	0.43	5	2-4
	10-60	18-35	1.35-1.70	0.06-0.2	0.11-0.23	6.1-8.4	Moderate------	0.37		
Cv----------------	0-13	2-8	1.40-1.50	6.0-20	0.02-0.06	5.6-8.4	Low-----------	0.15	5	.5-2
Crevasse	13-60	2-8	1.40-1.50	6.0-20	0.02-0.06	5.6-8.4	Low-----------	0.15		
De----------------	0-26	18-35	1.20-1.40	0.6-2.0	0.18-0.23	6.1-7.8	Low-----------	0.32	5	4-10
Dekoven	26-60	18-35	1.25-1.50	0.6-2.0	0.18-0.23	6.1-7.8	Low-----------	0.37		
Iu----------------	0-4	6-15	1.35-1.50	2.0-6.0	0.10-0.15	5.1-6.0	Low-----------	0.24	5	.5-2
Iuka	4-20	8-18	1.40-1.50	0.6-2.0	0.10-0.15	4.5-5.5	Low-----------	0.28		
	20-60	5-15	1.50-1.60	0.6-2.0	0.10-0.15	4.5-5.5	Low-----------	0.20		
Kb*:										
Keyespoint------	0-6	27-40	1.35-1.55	0.2-0.6	0.16-0.20	5.6-7.8	Moderate------	0.37	5	2-4
	6-28	35-60	1.30-1.50	<0.06	0.13-0.18	5.6-7.8	High----------	0.32		
	28-60	5-30	1.45-1.65	2.0-6.0	0.10-0.18	5.6-8.4	Low-----------	0.24		

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH				Pct
Kb*:										
Bardwell--------	0-17	8-30	1.10-1.30	0.6-2.0	0.18-0.24	5.6-7.8	Low-----------	0.28	5	4-6
	17-49	18-30	1.30-1.50	0.6-2.0	0.16-0.22	5.6-7.8	Low-----------	0.32		
	49-60	8-30	1.30-1.50	0.6-2.0	0.10-0.16	5.6-7.8	Low-----------	0.28		
LoB, LoC2--------	0-8	8-18	1.30-1.50	0.6-2.0	0.20-0.23	4.5-6.0	Low-----------	0.49	3	.5-2
Loring	8-27	18-32	1.40-1.50	0.6-2.0	0.20-0.22	4.5-6.0	Low-----------	0.43		
	27-60	15-30	1.50-1.70	0.06-0.2	0.06-0.13	4.5-6.0	Low-----------	0.43		
LoB3, LoC3, LoD3------------	0-7	8-25	1.30-1.50	0.6-2.0	0.20-0.23	4.5-6.0	Low-----------	0.49	3	.5-2
Loring	7-14	18-32	1.40-1.50	0.6-2.0	0.20-0.22	4.5-6.0	Low-----------	0.43		
	14-60	15-30	1.50-1.70	0.06-0.2	0.06-0.13	4.5-6.0	Low-----------	0.43		
LsE3*:										
Loring----------	0-7	8-25	1.30-1.50	0.6-2.0	0.20-0.23	4.5-6.0	Low-----------	0.49	3	.5-2
	7-14	18-32	1.40-1.50	0.6-2.0	0.20-0.22	4.5-6.0	Low-----------	0.43		
	14-60	15-30	1.50-1.70	0.06-0.2	0.06-0.13	4.5-6.0	Low-----------	0.43		
Memphis---------	0-6	8-22	1.30-1.50	0.6-2.0	0.20-0.23	4.5-6.0	Low-----------	0.49	5	1-2
	6-29	20-35	1.30-1.50	0.6-2.0	0.20-0.22	4.5-6.0	Low-----------	0.49		
	29-60	12-25	1.30-1.50	0.6-2.0	0.20-0.23	4.5-6.0	Low-----------	0.49		
Saffell---------	0-4	5-20	1.30-1.60	2.0-6.0	0.08-0.20	4.5-5.5	Low-----------	0.24	4	.5-2
	4-11	10-35	1.35-1.60	0.6-2.0	0.06-0.15	4.5-5.5	Low-----------	0.28		
	11-48	12-35	1.35-1.60	0.6-2.0	0.06-0.12	4.5-5.5	Low-----------	0.28		
	48-60	10-25	1.30-1.65	0.6-6.0	0.04-0.11	4.5-5.5	Low-----------	0.17		
MeB--------------	0-9	8-22	1.30-1.50	0.6-2.0	0.20-0.23	4.5-7.3	Low-----------	0.49	5	1-2
Memphis	9-32	20-35	1.30-1.50	0.6-2.0	0.20-0.22	4.5-7.3	Low-----------	0.49		
	32-60	12-30	1.30-1.50	0.6-2.0	0.20-0.23	4.5-6.0	Low-----------	0.49		
MeC2-------------	0-6	8-22	1.30-1.50	0.6-2.0	0.20-0.23	4.5-7.3	Low-----------	0.49	5	1-2
Memphis	6-29	20-35	1.30-1.50	0.6-2.0	0.20-0.22	4.5-6.0	Low-----------	0.49		
	29-60	12-30	1.30-1.50	0.6-2.0	0.20-0.23	4.5-6.0	Low-----------	0.49		
MmF3*:										
Memphis---------	0-6	8-25	1.30-1.50	0.6-2.0	0.20-0.23	4.5-6.0	Low-----------	0.49	5	1-2
	6-29	20-35	1.30-1.50	0.6-2.0	0.20-0.22	4.5-6.0	Low-----------	0.49		
	29-60	12-30	1.30-1.50	0.6-2.0	0.20-0.23	4.5-6.0	Low-----------	0.49		
Molena----------	0-6	2-7	1.35-1.55	6.0-20	0.05-0.07	4.5-6.5	Low-----------	0.10	5	.5-2
	6-60	5-10	1.45-1.60	6.0-20	0.06-0.09	4.5-6.0	Low-----------	0.17		
Mo---------------	0-10	14-27	1.35-1.65	0.6-2.0	0.21-0.23	6.1-7.8	Low-----------	0.43	5	2-4
Mhoon	10-60	18-35	1.35-1.70	0.06-0.2	0.11-0.23	6.1-8.4	Moderate-----	0.37		
Op---------------	0-8	40-60	1.30-1.60	0.2-0.6	0.14-0.18	5.1-7.8	High----------	0.32	5	2-4
Openlake	8-65	35-65	1.35-1.60	<0.06	0.13-0.17	5.1-7.8	High----------	0.32		
Pt*:										
Pits.										
Dumps.										
Rc*:										
Robinsonville---	0-8	5-15	1.40-1.50	2.0-6.0	0.15-0.22	6.1-8.4	Low-----------	0.32	5	.5-2
	8-60	5-15	1.50-1.60	0.6-6.0	0.14-0.18	6.1-8.4	Low-----------	0.32		
Crevasse--------	0-13	2-8	1.40-1.50	6.0-20	0.02-0.06	5.6-8.4	Low-----------	0.15	5	.5-2
	13-60	2-8	1.40-1.50	6.0-20	0.02-0.06	5.6-8.4	Low-----------	0.15		

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH				Pct
RnA* RtA*:										
Routon----------	0-10	15-27	1.40-1.55	0.6-2.0	0.20-0.24	4.5-6.5	Low----------	0.49	5	.5-2
	10-60	20-35	1.35-1.50	0.06-0.2	0.18-0.22	4.5-7.3	Low----------	0.49		
Center----------	0-6	12-27	1.35-1.50	0.6-2.0	0.18-0.22	5.1-6.5	Low----------	0.49	5	2-3
	6-37	18-32	1.30-1.50	0.2-0.6	0.16-0.20	5.1-6.5	Low----------	0.43		
	37-60	15-32	1.30-1.50	0.2-0.6	0.16-0.20	5.6-7.8	Low----------	0.49		

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--SOIL AND WATER FEATURES

("Flooding," "water table," and terms such as "rare," "brief," "apparent," and "perched" are explained in the text. The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern or that data were not estimated)

Soil name and map symbol	Hydrologic group	Flooding			High water table			Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Uncoated steel	Concrete
					Ft				
Ad: Adler	C	Frequent	Brief	Jan-Apr	2.0-3.0	Apparent	Jan-Apr	Moderate	Low.
Bd: Bardwell	B	Frequent	Brief to long.	Jan-Apr	3.0-6.0	Apparent	Feb-Mar	Low	Moderate.
Br*:									
Bowdre	C	Frequent	Brief to long.	Jan-Apr	1.5-2.0	Perched	Jan-Apr	High	Low.
Robinsonville	B	Frequent	Brief to long.	Jan-Apr	4.0-6.0	Apparent	Jan-Apr	Low	Low.
CaA: Calloway	C	None	---	---	1.0-2.0	Perched	Jan-Apr	High	Moderate.
CbA: Calloway	C	Rare	---	---	1.0-2.0	Perched	Jan-Apr	High	Moderate.
CeA: Center	C	Rare	---	---	1.0-2.5	Apparent	Dec-Mar	High	Moderate.
Cm: Commerce	C	Frequent	Brief to long.	Jan-Apr	1.5-4.0	Apparent	Dec-Apr	High	Low.
Cn*:									
Convent	C	Frequent	Brief	Jan-Apr	1.5-4.0	Apparent	Dec-Apr	High	Low.
Adler	C	Frequent	Brief	Jan-Apr	2.0-3.0	Apparent	Jan-Apr	Moderate	Low.
Ct*:									
Convent	C	Frequent	Brief to long.	Jan-Apr	1.5-4.0	Apparent	Dec-Apr	High	Low.
Mhoon	D	Frequent	Brief to long.	Jan-Apr	0-3.0	Apparent	Dec-Apr	High	Low.
Cv: Crevasse	A	Frequent	Brief to long.	Jan-Apr	3.5-6.0	Apparent	Nov-Mar	Low	Moderate.
De: Dekoven	D	Occasional	Brief	Jan-Apr	1.0-1.5	Apparent	Jan-Apr	Moderate	Low.
Iu: Iuka	C	Occasional	Brief	Jan-Apr	1.0-3.0	Apparent	Dec-Apr	Moderate	High.
Kb*:									
Keyespoint	D	Frequent	Brief to long.	Jan-Apr	2.0-3.5	Apparent	Jan-Apr	High	Low.
Bardwell	B	Frequent	Brief to long.	Jan-Apr	3.0-6.0	Apparent	Feb-Mar	Low	Moderate.
LoB: Loring	C	None	---	---	2.0-3.0	Perched	Dec-Mar	Moderate	Moderate.

See footnotes at end of table.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table: Depth	High water table: Kind	High water table: Months	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
					Ft				
LoB3-------------- Loring	C	None--------	---	---	1.2-2.0	Perched**	Dec-Mar	Moderate	Moderate.
LoC2-------------- Loring	C	None--------	---	---	2.0-3.0	Perched	Dec-Mar	Moderate	Moderate.
LoC3, LoD3-------- Loring	C	None--------	---	---	1.2-2.0	Perched**	Dec-Mar	Moderate	Moderate.
LsE3*:									
Loring-----------	C	None--------	---	---	1.2-2.0	Perched**	Dec-Mar	Moderate	Moderate.
Memphis----------	B	None--------	---	---	>6.0	---	---	Moderate	Moderate.
Saffell----------	B	None--------	---	---	>6.0	---	---	Low------	Moderate.
MeB, MeC2--------- Memphis	B	None--------	---	---	>6.0	---	---	Moderate	Moderate.
MmF3*:									
Memphis----------	B	None--------	---	---	>6.0	---	---	Moderate	Moderate.
Molena-----------	A	None--------	---	---	>6.0	---	---	Low------	High.
Mo---------------- Mhoon	D	Frequent----	Long to very long.	Jan-Dec	+1-3	Apparent	Jan-Dec	High-----	Low.
Op---------------- Openlake	D	Frequent----	Brief to long.	Jan-Apr	1.5-3.0	Apparent	Jan-Apr	High-----	Low.
Pt*:									
Pits.									
Dumps.									
Rc*:									
Robinsonville----	B	Frequent----	Brief to long.	Jan-Apr	4.0-6.0	Apparent	Jan-Apr	Low------	Low.
Crevasse---------	A	Frequent----	Brief to long.	Jan-Apr	3.5-6.0	Apparent	Nov-Mar	Low------	Moderate.
RnA*:									
Routon-----------	D	Rare--------	---	---	0-1.0	Apparent	Dec-Mar	High-----	Moderate.
Center-----------	C	Rare--------	---	---	1.0-2.5	Apparent	Dec-Mar	High-----	Moderate.
RtA*:									
Routon-----------	D	Occasional	Very brief	Jan-Apr	0-1.0	Apparent	Dec-Mar	High-----	Moderate.
Center-----------	C	Occasional	Very brief	Jan-Apr	1.0-2.5	Apparent	Dec-Mar	High-----	Moderate.

* See description of the map unit for composition and behavior characteristics of the map unit.
** See description of the map unit for an explanation of the water table in this unit.

TABLE 17.--PHYSICAL ANALYSES OF SELECTED SOILS

(The pedons for the soils listed are typical of the soil series in the survey area. For the location of the pedons, see the section "Soil Series and Their Morphology")

Soil name, report number, horizon, and depth in inches	Total			Size class and particle diameter (mm)							Textural class
				Sand							
	Sand (2-0.05 mm)	Silt (0.05-0.002 mm)	Clay (<0.002 mm)	Very coarse (2-1)	Coarse (1-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)	Sand coarser than very fine (2-0.1)	Very fine sand plus silt (0.1-0.002)	
	Pct <2mm										
Adler silt loam:											
(84KY-105-6)											
Ap1-------- 0-5	10.7	79.7	9.6	0.7	1.0	1.0	2.4	5.6	5.1	85.3	Silt loam.
Ap2-------- 5-11	9.2	80.4	10.4	0.2	0.6	0.9	2.4	5.1	4.1	85.5	Silt.
C1--------- 11-14	10.4	79.4	10.2	0.1	0.4	0.7	1.6	7.6	2.8	87.0	Silt loam.
C2--------- 14-27	9.7	80.4	9.9	0.0	0.4	2.4	2.5	4.4	5.3	84.8	Silt.
2Ab1------- 27-34	2.3	81.1	16.6	0.0	0.2	0.1	0.7	1.3	1.0	82.4	Silt loam.
2Ab2------- 34-38	5.6	76.2	18.2	0.4	0.3	0.3	1.0	3.6	2.0	79.8	Silt loam.
2Bwb------- 38-45	5.1	72.2	22.7	0.5	0.4	0.3	0.9	3.0	2.1	75.2	Silt loam.
2BCb------- 45-60	5.6	77.0	17.4	1.0	0.8	0.4	0.7	2.7	2.9	79.7	Silt loam.
Calloway silt loam:											
(84KY-105-3)											
Ap--------- 0-8	7.8	72.4	19.8	0.5	0.8	0.6	1.2	4.7	3.1	77.1	Silt loam.
Bw--------- 8-13	8.9	72.9	18.2	0.4	0.7	0.4	0.5	6.9	2.0	79.8	Silt loam.
E---------- 13-19	7.8	71.8	20.4	0.7	1.0	0.4	0.5	5.2	2.6	77.0	Silt loam.
Btx1------- 19-32	5.0	67.5	27.5	0.2	0.3	0.4	0.3	3.8	1.2	71.3	Silty clay loam.
Btx2------- 32-48	11.2	67.2	21.6	0.0	0.4	0.4	0.6	9.8	1.4	77.0	Silt loam.
Btx3------- 48-60	6.3	80.1	13.6	0.0	0.4	0.3	0.5	5.1	1.2	85.2	Silt loam.
Bx streaks 48-60	8.2	73.3	18.5	0.1	0.3	0.3	0.3	7.2	1.0	80.5	Silt loam.
Keyespoint silty clay loam:											
(84KY-039-2)											
Ap-------- 0-6	1.8	62.3	35.9	0.5	0.4	0.2	0.3	0.4	1.4	62.7	Silty clay loam.
Bg1------- 6-19	1.0	57.4	41.6	0.1	0.2	0.1	0.2	0.4	0.6	57.8	Silty clay.
Bg2------- 19-28	2.3	61.6	36.1	0.0	0.2	0.2	0.8	1.1	1.2	62.7	Silty clay loam.
2C1------- 28-42	81.3	13.1	5.6	0.0	0.0	0.1	36.7	44.5	36.8	57.6	Loamy sand.
2C2------- 42-60	75.9	15.9	8.2	0.0	0.4	0.5	11.7	63.3	12.6	79.2	Very fine sandy loam.

TABLE 17.--PHYSICAL ANALYSES OF SELECTED SOILS--Continued

Soil name, report number, horizon, and depth in inches	Total: Sand (2-0.05 mm)	Total: Silt (0.05-0.002 mm)	Total: Clay (<0.002 mm)	Sand: Very coarse (2-1)	Sand: Coarse (1-0.5)	Sand: Medium (0.5-0.25)	Sand: Fine (0.25-0.1)	Sand: Very fine (0.1-0.05)	Sand coarser than very fine (2-0.1)	Very fine sand plus silt (0.1-0.002)	Textural class
	Pct <2mm										
Loring silt loam: (84KY-105-4)											
Ap-------- 0-8	10.5	77.4	12.1	0.7	0.8	0.8	1.6	6.6	3.9	84.0	Silt loam.
Bt1------- 8-22	15.8	60.1	24.1	0.1	0.2	0.3	0.5	14.7	1.1	74.8	Silt loam.
Bt2------- 22-27	6.8	70.9	22.3	0.0	0.2	0.2	0.3	6.1	0.7	77.0	Silt loam.
Btx1------ 27-37	6.8	68.2	25.0	0.1	0.2	0.2	0.2	6.1	0.7	74.3	Silt loam.
Btx2------ 37-60	12.4	64.0	23.6	0.0	0.2	0.2	0.4	11.6	0.8	75.6	Silt loam.
Memphis silt loam: (84KY-105-2)											
Ap-------- 0-9	12.2	75.0	12.8	0.2	0.6	0.9	2.2	8.3	3.9	83.3	Silt loam.
Bt1------- 9-14	8.1	68.2	23.7	0.1	0.2	0.2	0.5	7.1	1.0	75.3	Silt loam.
Bt2------- 14-32	4.8	64.3	30.9	0.2	0.3	0.3	0.4	3.6	1.2	67.9	Silty clay loam.
Bt3------- 32-47	3.6	71.8	24.6	0.0	0.0	0.2	0.3	3.1	0.5	74.9	Silt loam.
BC-------- 47-60	10.8	68.8	20.4	0.1	0.2	0.2	0.3	10.0	0.8	78.8	Silt loam.
Openlake silty clay: (84KY-039-3)											
Ap------- 0-8	1.1	51.7	47.2	0.1	0.2	0.2	0.3	0.3	0.8	52.0	Silty clay.
BA------- 8-20	2.2	46.6	51.2	0.1	0.5	0.4	0.6	0.6	1.6	47.2	Silty clay.
Bg1------ 20-27	0.3	59.7	40.0	0.0	0.1	0.0	0.1	0.1	0.2	59.8	Silty clay.
Bg2------ 27-34	0.6	61.4	38.0	0.2	0.2	0.0	0.1	0.1	0.5	61.5	Silty clay loam.
Bg3------ 34-52	0.4	47.4	52.2	0.0	0.1	0.0	0.1	0.2	0.2	47.6	Silty clay.
Bg4------ 52-65	0.6	58.3	41.1	0.0	0.0	0.0	0.2	0.4	0.2	58.7	Silty clay.

TABLE 18.--CHEMICAL ANALYSES OF SELECTED SOILS

(A dash indicates that the element was not detected. An asterisk indicates that a determination was not made. TR indicates trace. The pedons for the soils listed are typical of the series in the survey area. For the location of the pedons, see the section "Soil Series and Their Morphology")

Soil name, report number, horizon, and depth in inches	pH		Extractable cations					Cation-exchange capacity		Extract-able aluminum	Aluminum	Base saturation		Organic matter	Calcium carbonate equivalent	Potas-sium
	H_2O 1:1	KCl 1N 1:1	Ca	Mg	K	Na	Total (TEC)	Ammonium acetate	Sum of cations			Ammonium acetate	Sum of cations			
			Milliequivalents per 100 grams of soil										Pct	Pct	Pct	p/m
Adler silt loam:																
(84KY-105-6)																
Ap1------- 0 to 5	6.7	7.1	2.9	1.1	0.3	0.1	4.4	6.8	16.7	12.3	*	65	26	1.5	0.3	54
Ap2------- 5 to 11	6.6	7.0	1.2	0.9	0.1	0.2	2.4	7.6	12.8	10.4	*	32	19	1.4	0.1	56
C1-------- 11 to 14	6.6	7.1	2.8	0.6	0.1	0.1	3.6	6.6	7.4	3.8	*	55	49	0.9	0.1	45
C2-------- 14 to 27	6.2	7.0	2.2	0.9	0.1	0.2	3.4	6.3	9.6	6.2	*	54	35	0.6	0.1	19
2Ab1------ 27 to 34	5.2	6.4	2.5	1.9	0.2	0.2	4.8	11.0	11.4	6.6	*	44	42	1.0	0.1	26
2Ab2------ 34 to 38	4.8	5.9	1.3	1.2	0.1	0.2	2.8	11.6	18.5	15.7	*	24	15	2.1	0.2	60
2Bwb------ 38 to 45	4.7	5.7	1.1	1.0	0.1	0.2	2.4	11.8	16.8	14.4	*	20	14	1.6	0.2	35
2BCb------ 45 to 60	4.9	6.1	3.2	0.8	0.2	0.2	4.4	11.8	18.7	14.3	*	37	24	0.8	0.1	26
Calloway silt loam:																
(84KY-105-3)																
Ap-------- 0 to 8	5.0	4.4	3.6	1.2	TR	0.1	4.9	10.4	12.7	7.8	---	47	39	1.5	0.1	33
Bw-------- 8 to 13	4.7	4.3	3.8	1.8	TR	0.1	5.7	11.6	15.0	9.3	---	49	38	0.3	0.2	13
E--------- 13 to 19	4.7	4.1	2.3	2.6	TR	0.1	5.0	11.6	14.5	9.5	---	43	34	0.1	0.2	10
Btx1------ 19 to 32	4.6	3.8	3.1	5.9	TR	0.4	9.4	18.8	20.5	11.1	0.2	50	46	0.1	0.1	16
Btx2------ 32 to 48	5.1	4.3	3.0	6.9	TR	0.4	10.3	16.3	20.8	10.5	---	63	50	---	0.2	24
Btx3------ 48 to 60	5.1	4.4	4.0	5.8	TR	0.1	9.9	16.3	16.3	6.4	0.2	61	61	---	0.1	64
Keyespoint silty clay loam:																
(84KY-039-2)																
Ap------- 0 to 6	7.1	7.2	22.4	6.5	1.0	0.2	30.1	18.8	34.8	4.7	*	160	86	4.0	0.7	128
Bg1------ 6 to 19	7.2	7.1	15.9	6.6	0.9	0.2	23.6	20.1	28.7	5.1	*	117	82	2.5	0.2	71
Bg2------ 19 to 28	7.2	7.1	11.1	5.1	0.6	0.2	17.0	23.4	24.1	7.1	*	73	70	2.3	0.2	28
2C1------ 28 to 42	7.4	7.4	6.4	1.4	0.2	0.2	8.2	9.4	10.6	2.4	*	87	77	0.5	3.3	32
2C2------ 42 to 60	7.7	7.4	8.3	1.6	0.2	0.2	10.3	10.8	12.2	1.9	*	95	84	0.6	4.2	33
Loring silt loam:																
(84KY-105-4)																
Ap-------- 0 to 8	5.7	5.2	3.1	0.5	0.1	0.1	3.8	6.7	9.1	5.3	0.1	57	42	1.7	0.1	111
Bt1------- 8 to 22	6.0	5.4	7.2	1.8	TR	0.1	9.1	12.7	12.1	3.0	TR	72	75	0.3	0.2	104
Bt2------- 22 to 27	5.7	5.0	5.9	3.5	TR	0.1	9.5	14.2	14.5	5.0	---	67	66	0.1	0.2	90
Btx1------ 27 to 37	4.9	4.1	5.6	4.2	TR	0.2	10.0	17.0	19.2	9.2	TR	59	52	0.1	0.1	53
Btx2------ 37 to 60	4.8	4.0	5.6	4.1	0.1	0.1	9.9	16.4	18.4	8.5	0.1	60	54	---	0.1	59

TABLE 18.--CHEMICAL ANALYSES OF SELECTED SOILS--Continued

Soil name, report number, horizon, and depth in inches	pH		Extractable cations					Cation-exchange capacity				Base saturation				
	H_2O 1:1	KCl 1N 1:1	Ca	Mg	K	Na	Total (TEC)	Ammonium acetate	Sum of cations	Extractable aluminum	Aluminum	Ammonium acetate	Sum of cations	Organic matter	Calcium carbonate equivalent	Potassium
			---------------Milliequivalents per 100 grams of soil---------------										Pct	Pct	Pct	p/m
Memphis silt loam:																
(84KY-105-2)																
Ap-------- 0 to 9	7.2	6.5	7.4	0.2	TR	0.1	7.7	7.3	9.8	2.1	TR	105	79	1.2	0.3	44
Bt1------- 9 to 14	7.0	6.4	11.9	2.6	TR	0.1	14.6	11.4	18.5	3.9	0.1	128	79	0.3	0.2	55
Bt2------- 14 to 32	6.0	6.0	10.0	2.1	TR	0.1	12.2	15.7	17.2	5.0	TR	78	71	0.3	0.1	81
Bt3------- 32 to 47	6.0	5.3	6.8	4.2	TR	0.1	11.1	14.7	15.9	4.8	TR	76	70	0.1	0.3	73
BC-------- 47 to 60	5.2	4.6	4.8	3.9	TR	0.1	8.8	13.1	16.1	7.3	0.1	67	55	---	0.2	48
Openlake silty clay:																
(84KY-039-3)																
Ap-------- 0 to 8	7.5	7.2	22.8	7.1	1.0	0.2	31.1	19.3	35.4	4.3	*	161	88	3.7	1.0	79
BA-------- 8 to 20	7.4	7.1	23.4	7.0	1.1	0.3	31.8	21.7	42.9	11.1	*	147	74	4.0	0.4	122
Bg1------- 20 to 27	7.4	7.2	18.8	7.1	1.0	0.3	27.2	26.3	36.5	9.3	*	102	75	1.9	0.5	84
Bg2------- 27 to 34	7.3	7.2	18.0	6.6	1.0	0.3	25.9	28.2	35.8	9.9	*	92	72	2.4	0.8	81
Bg3------- 34 to 52	7.3	7.1	20.8	7.2	1.2	0.4	29.6	30.0	37.3	7.7	*	99	79	2.5	0.4	57
Bg4------- 52 to 65	7.3	7.2	16.2	6.4	0.8	0.3	23.7	27.7	40.2	16.5	*	86	59	2.4	0.5	50

TABLE 19.--ENGINEERING TEST DATA

(Dashes indicate that data were not available. LL means liquid limit; PI, plasticity index; MD, maximum dry density; OM, optimum moisture; and NP, nonplastic. The pedons for the soils listed are typical of the series in the survey area. For the location of the pedons, see the section "Soil Series and Their Morphology")

Soil name, report number, horizon, and depth in inches	Classification		Grain-size distribution										LL	PI	Moisture density		Specific gravity
			Percentage passing sieve--							Percentage smaller than--							
	AASHTO	Unified	2 inch	3/4 inch	3/8 inch	No. 4	No. 10	No. 40	No. 200	.02 mm	.005 mm	.002 mm			MD	OM	
													Pct		Lb/ cu ft	Pct	
Calloway silt loam: (84KY-105-3)																	
Bw------ 8 to 13	A-4	ML	100	100	100	100	100	100	100	63	26	17	35	10	103	20	2.67
Btx1--- 19 to 32	A-6	CL	100	100	100	100	100	100	98	60	76	11	36	12	103	20	2.67
Btx2, Btx3-- 32 to 60	A-6	CL	100	100	100	100	100	100	95	53	19	17	35	12	103	19	2.69
Keyespoint silty clay loam: (84KY-039-2)																	
Bg1---- 6 to 19	A-7-6	CH	100	100	100	100	100	100	95	82	54	40	59	32	91	29	2.75
2C1---- 28 to 42	A-4	SM	100	100	100	100	100	100	40	14	10	5	---	NP	103	16	2.71
Loring silt loam: (84KY-105-4)																	
Bt1---- 8 to 22	A-6	CL	100	100	100	100	100	100	95	60	26	17	35	12	105	17	2.71
Btx1--- 27 to 37	A-6	CL	100	100	100	100	100	100	98	72	39	23	35	12	103	20	2.68
Memphis silt loam: (84KY-105-2)																	
Bt2---- 14 to 32	A-7-6	CL	100	100	100	100	100	100	100	60	32	23	41	26	104	20	2.69
BC----- 47 to 60	A-6	CL	100	100	100	100	100	100	100	56	26	17	40	18	103	19	2.69
Openlake silty clay: (84KY-039-3)																	
BA----- 8 to 20	A-7-5	MH	100	100	100	100	100	100	92	85	63	43	72	33	86	30	2.68
Bg3---- 34 to 52	A-7-5	MH	100	100	100	100	100	100	100	92	66	51	73	36	88	28	2.74
Bg4---- 52 to 65	A-7-6	CH	100	100	100	100	100	100	98	87	53	39	55	27	92	26	2.71

TABLE 20.--CLASSIFICATION OF THE SOILS

(An asterisk in the first column indicates that the soil is a taxadjunct to the series. See text for a description of those characteristics of the soil that are outside the range of the series)

Soil name	Family or higher taxonomic class
Adler	Coarse-silty, mixed, nonacid, thermic Aquic Udifluvents
Bardwell	Fine-silty, mixed, thermic Fluventic Hapludolls
Bowdre	Clayey over loamy, montmorillonitic, thermic Fluvaquentic Hapludolls
Calloway	Fine-silty, mixed, thermic Glossaquic Fragiudalfs
Center	Fine-silty, mixed, thermic Aquic Hapludalfs
Commerce	Fine-silty, mixed, nonacid, thermic Aeric Fluvaquents
Convent	Coarse-silty, mixed, nonacid, thermic Aeric Fluvaquents
Crevasse	Mixed, thermic Typic Udipsamments
Dekoven	Fine-silty, mixed, thermic Fluvaquentic Haplaquolls
Iuka	Coarse-loamy, siliceous, acid, thermic Aquic Udifluvents
Keyespoint	Clayey over loamy, montmorillonitic, nonacid, thermic Vertic Haplaquepts
Loring	Fine-silty, mixed, thermic Typic Fragiudalfs
*Memphis	Fine-silty, mixed, thermic Typic Hapludalfs
Mhoon	Fine-silty, mixed, nonacid, thermic Typic Fluvaquents
*Molena	Sandy, mixed, thermic Psammentic Hapludults
Openlake	Fine, montmorillonitic, nonacid, thermic Vertic Haplaquepts
Robinsonville	Coarse-loamy, mixed, nonacid, thermic Typic Udifluvents
Routon	Fine-silty, mixed, thermic Typic Ochraqualfs
Saffell	Loamy-skeletal, siliceous, thermic Typic Hapludults

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If you wish to file an employment complaint, you must contact your agency's EEO Counselor (http://directives.sc.egov.usda.gov/33081.wba) within 45 days of the date of the alleged discriminatory act, event, or personnel action. Additional information can be found online at http://www.ascr.usda.gov/complaint_filing_file.html.

To File a Program Complaint

If you wish to file a Civil Rights program complaint of discrimination, complete the USDA Program Discrimination Complaint Form, found online at http://www.ascr.usda.gov/complaint_filing_cust.html or at any USDA office, or call (866) 632-9992 to request the form. You may also write a letter containing all of the information requested in the form. Send your completed complaint form or letter by mail to U.S. Department of Agriculture; Director, Office of Adjudication; 1400 Independence Avenue, S.W.; Washington, D.C. 20250-9419; by fax to (202) 690-7442; or by email to program.intake@usda.gov.

Persons with Disabilities

If you are deaf, are hard of hearing, or have speech disabilities and you wish to file either an EEO or program complaint, please contact USDA through the Federal Relay Service at (800) 877-8339 or (800) 845-6136 (in Spanish).

If you have other disabilities and wish to file a program complaint, please see the contact information above. If you require alternative means of communication for

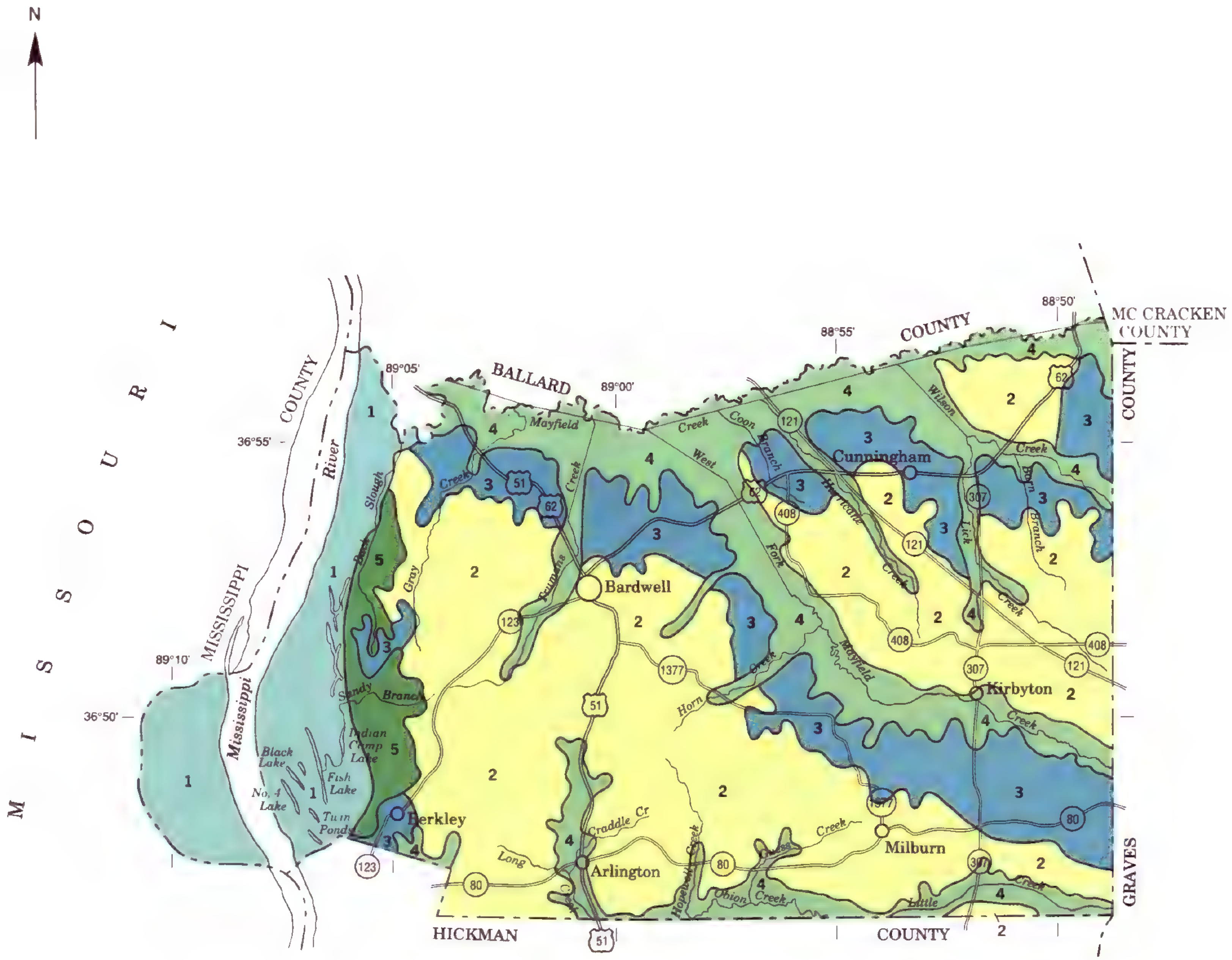
program information (e.g., Braille, large print, audiotape, etc.), please contact USDA's TARGET Center at (202) 720-2600 (voice and TDD).

Supplemental Nutrition Assistance Program

For additional information dealing with Supplemental Nutrition Assistance Program (SNAP) issues, call either the USDA SNAP Hotline Number at (800) 221-5689, which is also in Spanish, or the State Information/Hotline Numbers (http://directives.sc.egov.usda.gov/33085.wba).

All Other Inquiries

For information not pertaining to civil rights, please refer to the listing of the USDA Agencies and Offices (http://directives.sc.egov.usda.gov/33086.wba).



SOIL LEGEND*

1	OPENLAKE-BARDWELL-COMMERCE-ROBINSONVILLE
2	LORING-MEMPHIS
3	LORING-ADLER
4	CONVENT-ADLER-MHOON
5	MEMPHIS-LORING-MOLENA

* The units on this legend are described in the text under the heading "General Soil Map Units."

Compiled 1995

UNITED STATES DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE
KENTUCKY NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
KENTUCKY AGRICULTURAL EXPERIMENT STATION

GENERAL SOIL MAP

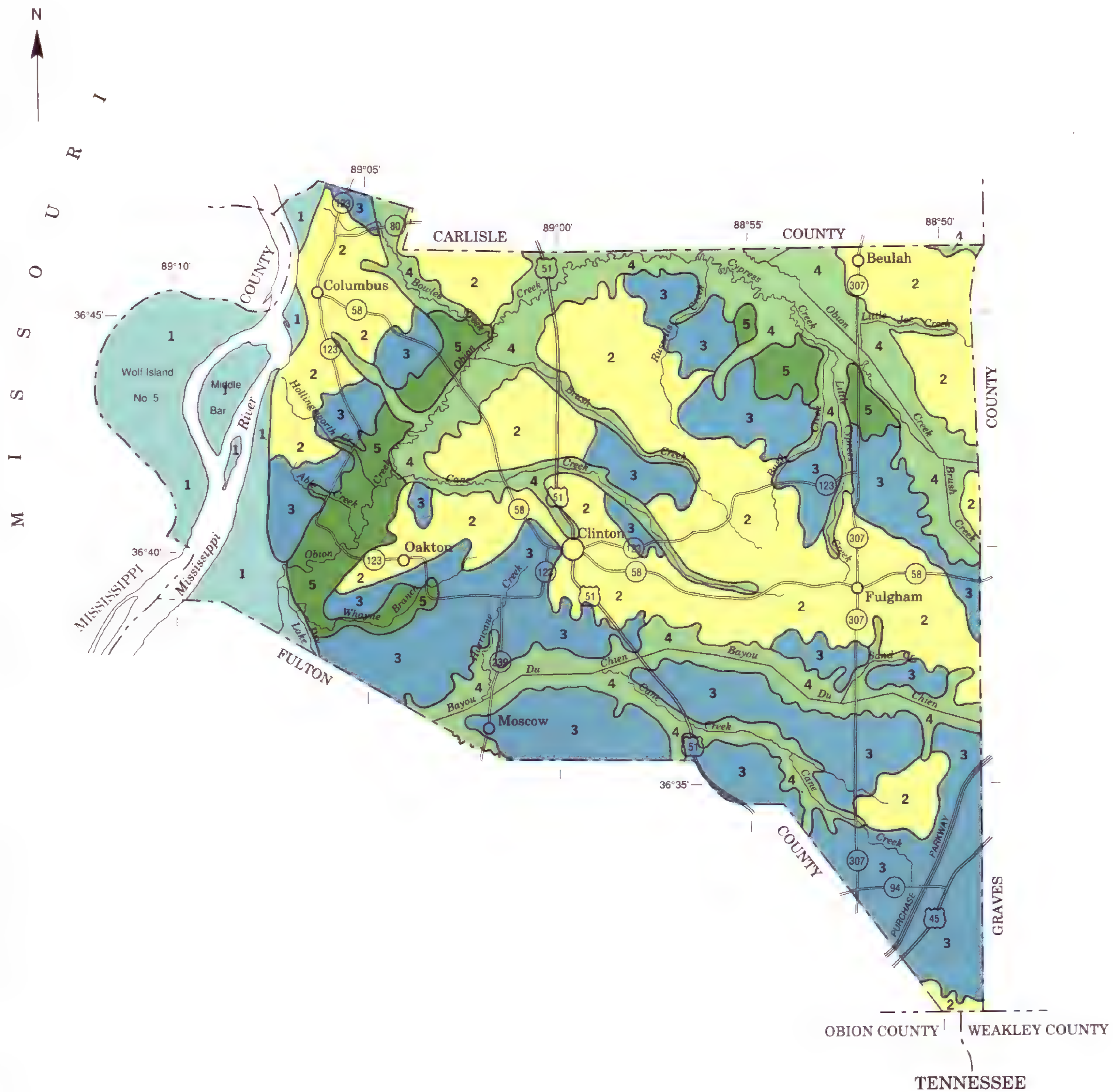
CARLISLE COUNTY, KENTUCKY

Scale 1:190,080

1 0 1 2 3 Mi

1 0 3 6 Km

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.



SOIL LEGEND*

1 OPENLAKE-COMMERCE-BARDWELL
2 LORING-MEMPHIS
3 LORING-ADLER
4 CONVENT-ADLER-MHOON
5 ROUTON-CALLOWAY-CONVENT-LORING

* The units on this legend are described in the text under the heading "General Soil Map Units."

Compiled 1995

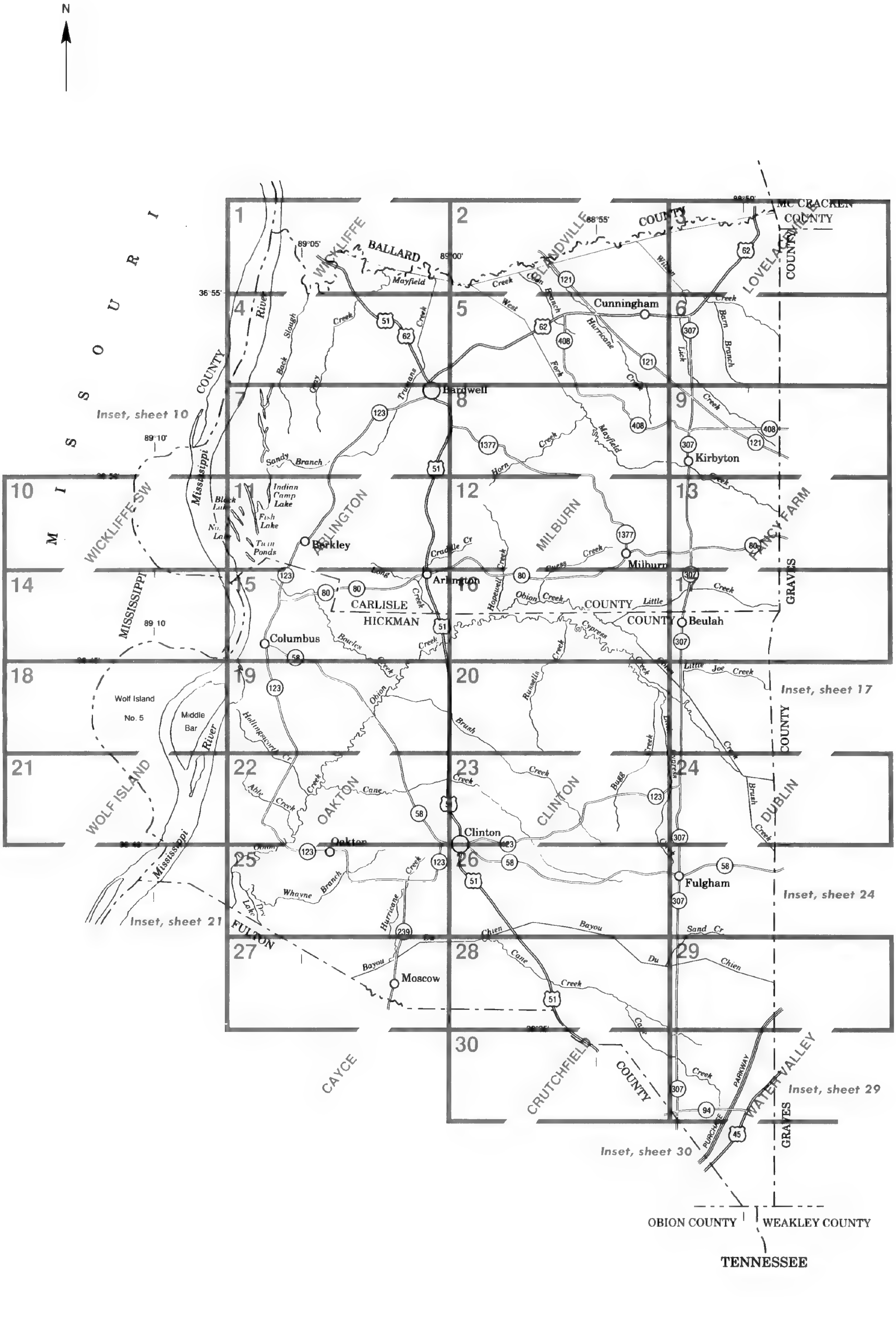
UNITED STATES DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE
KENTUCKY NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
KENTUCKY AGRICULTURAL EXPERIMENT STATION

GENERAL SOIL MAP
HICKMAN COUNTY, KENTUCKY

Scale 1:190,080

1 0 1 2 3 Mi
1 0 3 6 Km

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.



INDEX TO MAP SHEETS

CARLISLE AND HICKMAN COUNTIES, KENTUCKY

Scale 1:190,080

SOIL LEGEND

Map symbols consist of a combination of letters or of letters and a number. The first two letters represent the kind of soil. A capital letter following these letters indicates the class of slope. Symbols without a slope letter are for nearly level soils or for miscellaneous areas. A final number of 2 indicates that the soil is eroded and 3 that it is severely eroded.

SYMBOL	NAME
Ad	Adler silt loam, frequently flooded
Bd	Bardwell silt loam, frequently flooded
Br	Bowdre-Robinsonville complex, frequently flooded
CaA	Calloway silt loam, 0 to 3 percent slopes
CbA	Calloway silt loam, 0 to 2 percent slopes, rarely flooded
CeA	Center silt loam, 0 to 3 percent slopes, rarely flooded
Cm	Commerce silt loam, frequently flooded
Cn	Convent-Adler silt loams, frequently flooded
Ct	Convent-Mhoon silt loams, frequently flooded
Cv	Crevasse sand, frequently flooded
De	Dekoven silt loam, overwash, occasionally flooded
Iu	Iuka sandy loam, occasionally flooded
Kb	Keyespoint and Bardwell soils, frequently flooded
LoB	Loring silt loam, 2 to 6 percent slopes
LoB3	Loring silt loam, 2 to 6 percent slopes, severely eroded
LoC2	Loring silt loam, 6 to 12 percent slopes, eroded
LoC3	Loring silt loam, 6 to 12 percent slopes, severely eroded
LoD3	Loring silt loam, 12 to 20 percent slopes, severely eroded
LsE3	Loring-Memphis-Saffell complex, 12 to 30 percent slopes, severely eroded
MeB	Memphis silt loam, 2 to 6 percent slopes
MeC2	Memphis silt loam, 6 to 12 percent slopes, eroded
MmF3	Memphis-Molena complex, 20 to 40 percent slopes, severely eroded
Mo	Mhoon silt loam, ponded
Op	Openlake silty clay, frequently flooded
Pt	Pits-Dumps complex
Rc	Robinsonville-Crevasse complex, frequently flooded
RnA	Routon-Center silt loams, 0 to 2 percent slopes, rarely flooded
RtA	Routon-Center silt loams, 0 to 2 percent slopes, occasionally flooded

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES
- National, state, or province
- County or parish
- Minor civil division
- Reservation (national forest or park, state forest or park, and large airport)
- Land grant
- Limit of soil survey (label)
- Field sheet matchline and neatline

AD HOC BOUNDARY (label) — Davis Airstrip

Small airport, airfield, park, oilfield, cemetery, or flood pool — FLOOD POOL LINE

STATE COORDINATE TICK
1 890 000 FEET

LAND DIVISION CORNER
(sections and land grants)

ROADS
- Divided (median shown if scale permits)
- Other roads
- Trail

ROAD EMBLEM & DESIGNATIONS
- "Purchase Parkway"
- Federal — 287
- State — 52
- County, farm or ranch — 1283

RAILROAD Name only

POWER TRANSMISSION LINE (normally not shown)

PIPE LINE (normally not shown)

FENCE (normally not shown)

LEVEES
- Without road
- With road
- With railroad

DAMS
- Large (to scale)
- Medium or Small (Named where applicable) — water

PITS — w
- Gravel pit
- Mine or quarry

MISCELLANEOUS CULTURAL FEATURES
- Farmstead, house (omit in urban area) (occupied)
- Church
- School
- Indian mound (label) — Indian Mound
- Located object (label) — Tower
- Tank (label) — Gas
- Wells, oil or gas
- Windmill
- Kitchen midden

WATER FEATURES

DRAINAGE
- Perennial, double line
- Perennial, single line
- Intermittent
- Drainage end
- Canals or ditches
  - Double-line (label) — CANAL
  - Drainage and/or irrigation

LAKES, PONDS AND RESERVOIRS
- Perennial — water, w
- Intermittent — int, i

MISCELLANEOUS WATER FEATURES
- Marsh or swamp
- Spring
- Well, artesian
- Well, irrigation
- Wet spot

SPECIAL SYMBOLS FOR SOIL SURVEY

SOIL DELINEATIONS AND SYMBOLS — LoB MeC2

ESCARPMENTS
- Bedrock (points down slope)
- Other than bedrock (points down slope)

SHORT STEEP SLOPE

GULLY

DEPRESSION OR SINK

SOIL SAMPLE — S

MISCELLANEOUS
- Blowout
- Clay spot
- Gravelly spot
- Gumbo, slick or scabby spot (sodic)
- Dumps and other similar non soil areas
- Prominent hill or peak
- Rock outcrop (includes sandstone and shale)
- Saline spot
- Sandy spot
- Severely eroded spot
- Slide or slip (tips point upslope)
- Stony spot, very stony spot

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1985 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

CARLISLE AND HICKMAN COS., KY NO. 1

CARLISLE AND HICKMAN COS., KY NO. 2

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N

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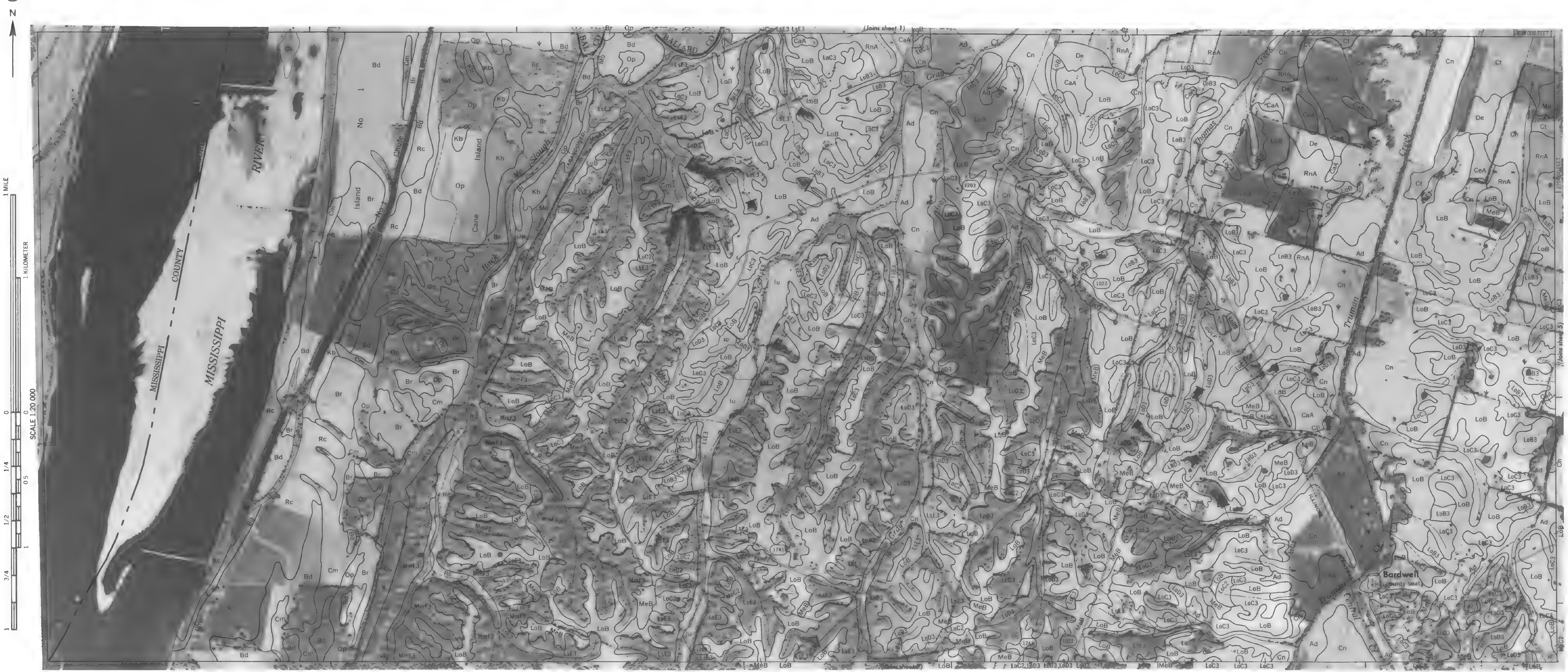
CARLISLE AND HICKMAN COS, KY NO. 3

1 MILE
1 KILOMETER
SCALE 1:20 000



CARLISLE AND HICKMAN COS., KY NO. 4

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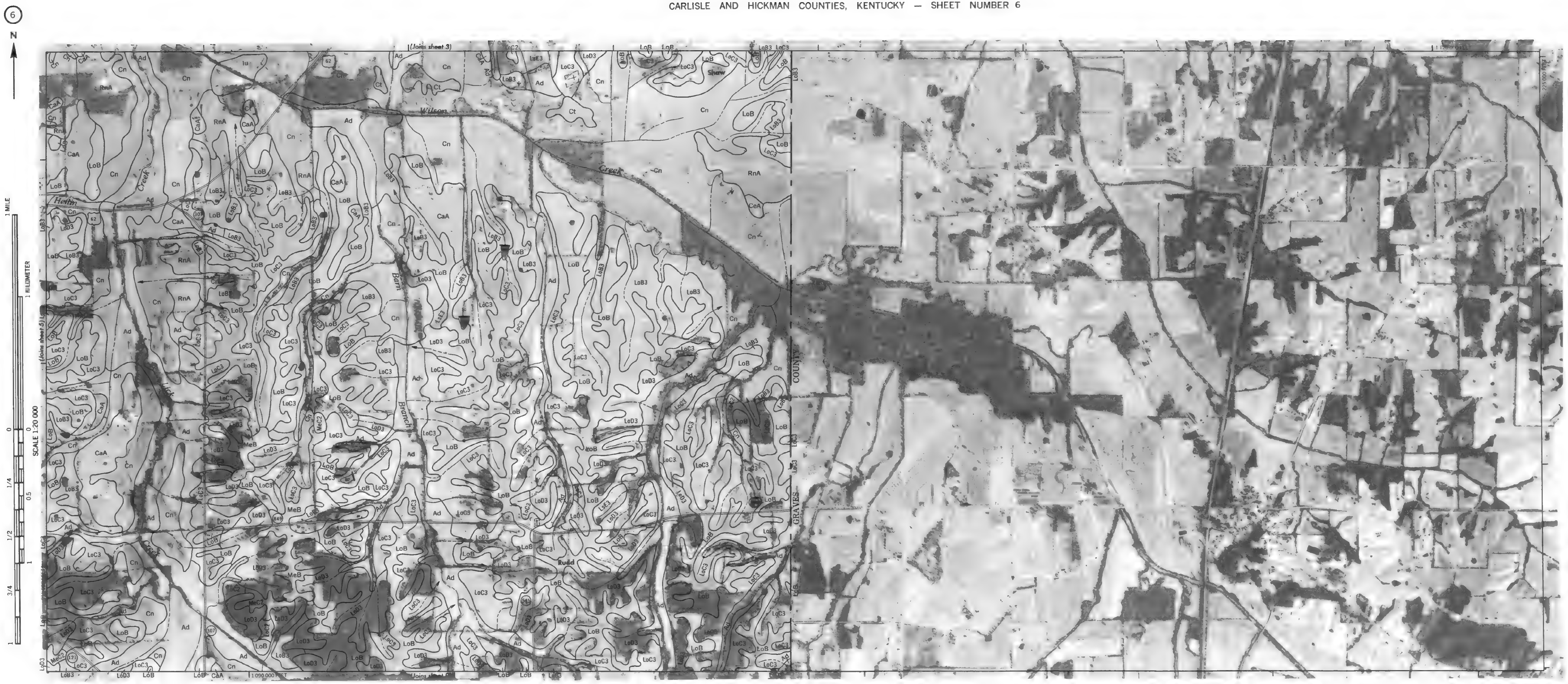
CARLISLE AND HICKMAN COS., KY NO. 5



CARLISLE AND HICKMAN COS., KY NO. 6

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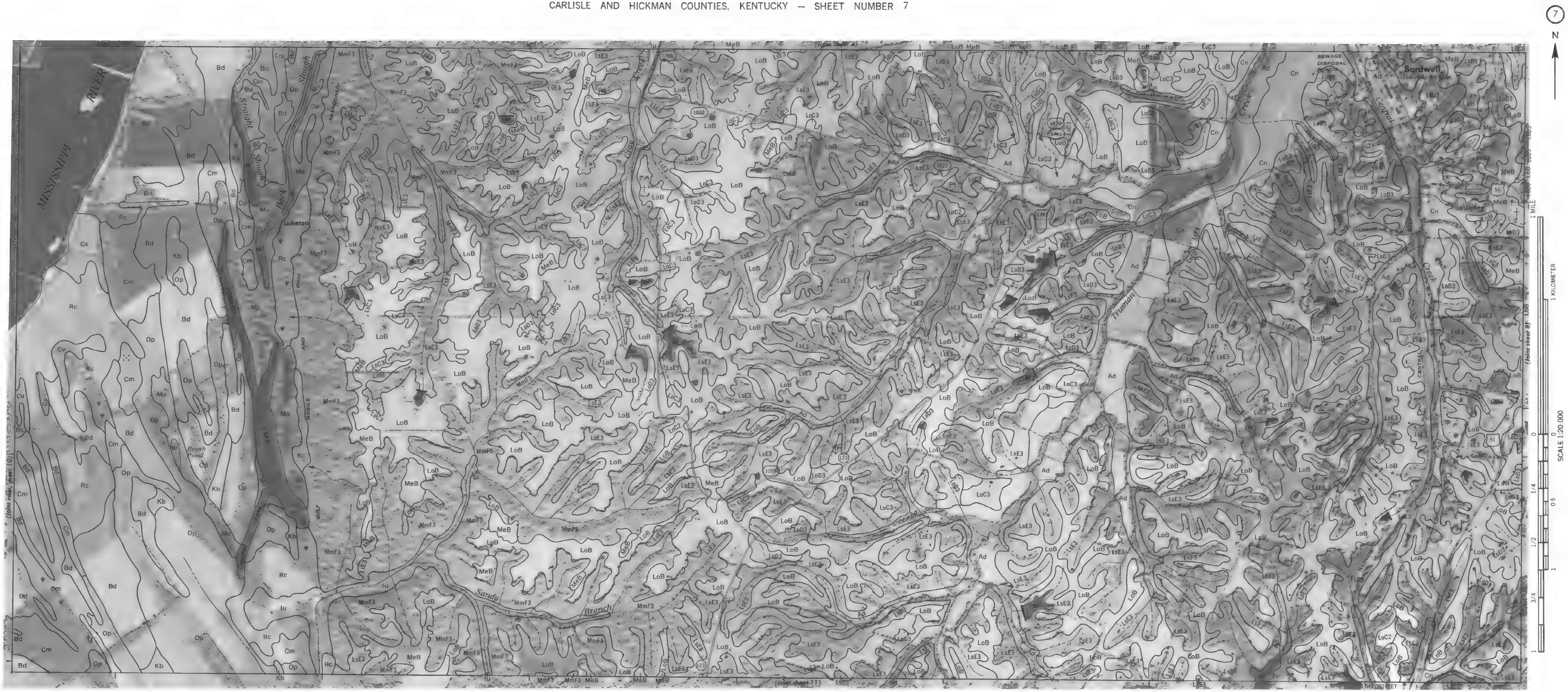

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CARLISLE AND HICKMAN COS., KY NO. 7

N

1 MILE

1 KILOMETER

SCALE 1:20 000

CARLISLE AND HICKMAN COS., KY NO. 8

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9

N

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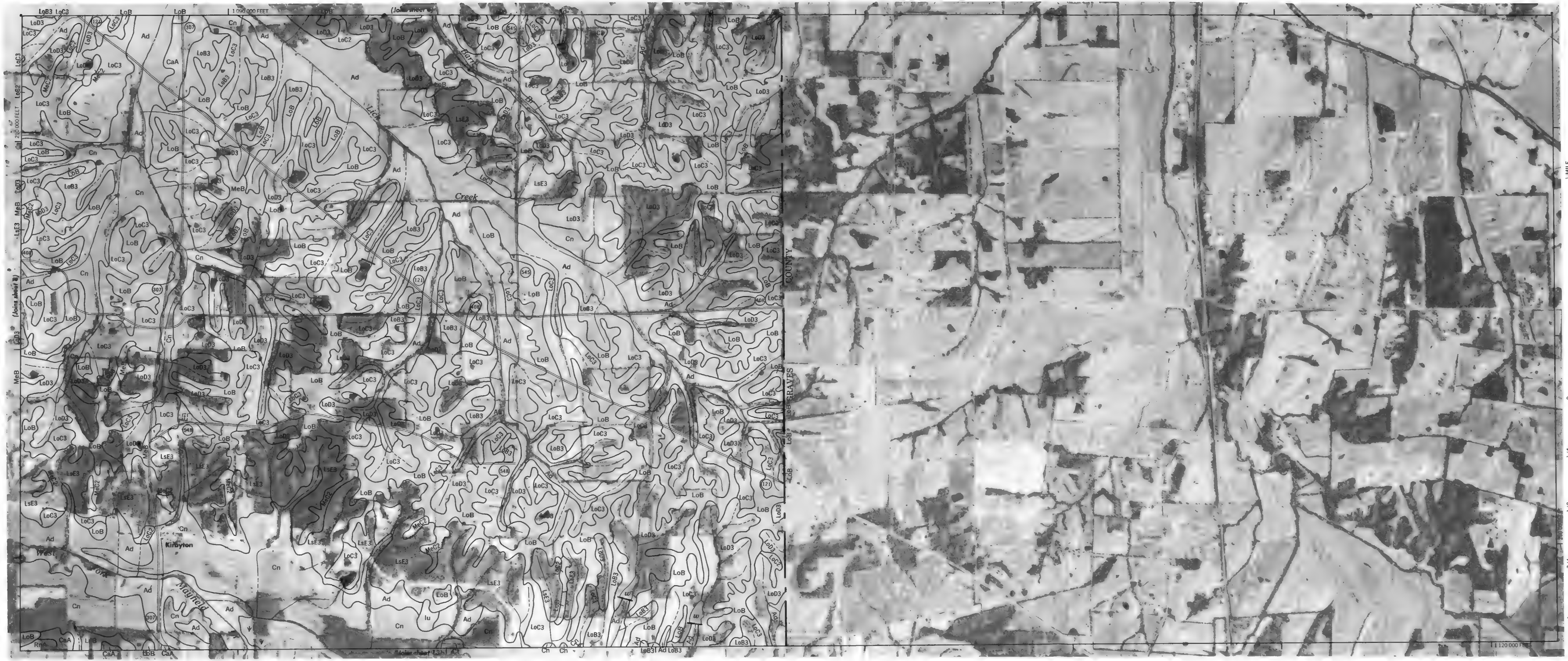
CARLISLE AND HICKMAN COS., KY NO. 9



1 MILE

1 KILOMETER

SCALE 1:20 000

0 1/4 1/2 3/4 1

0 0.5 1

CARLISLE AND HICKMAN COS., KY NO. 10

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CARLISLE AND HICKMAN COS., KY NO. 11

CARLISLE AND HICKMAN COS., KY NO. 12

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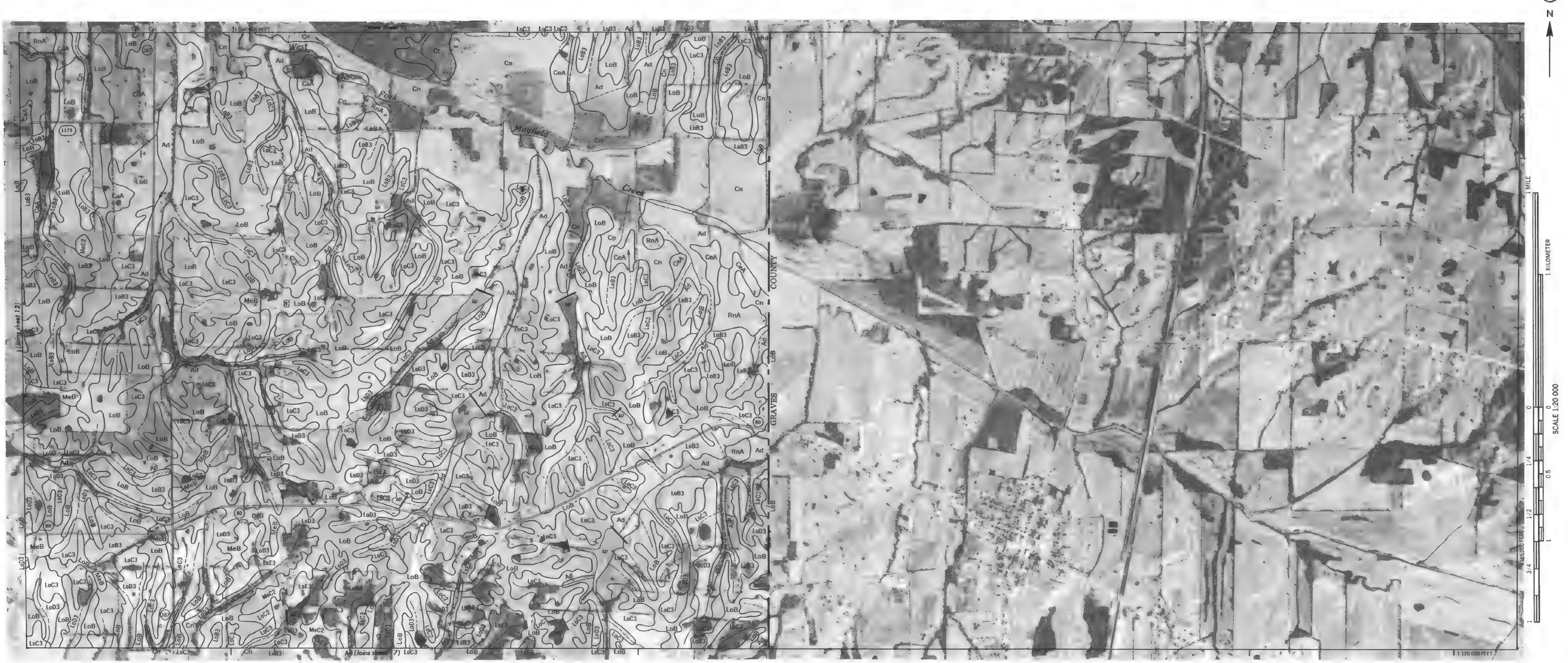
CARLISLE AND HICKMAN COS., KY NO. 13



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CARLISLE AND HICKMAN COS., KY NO. 14

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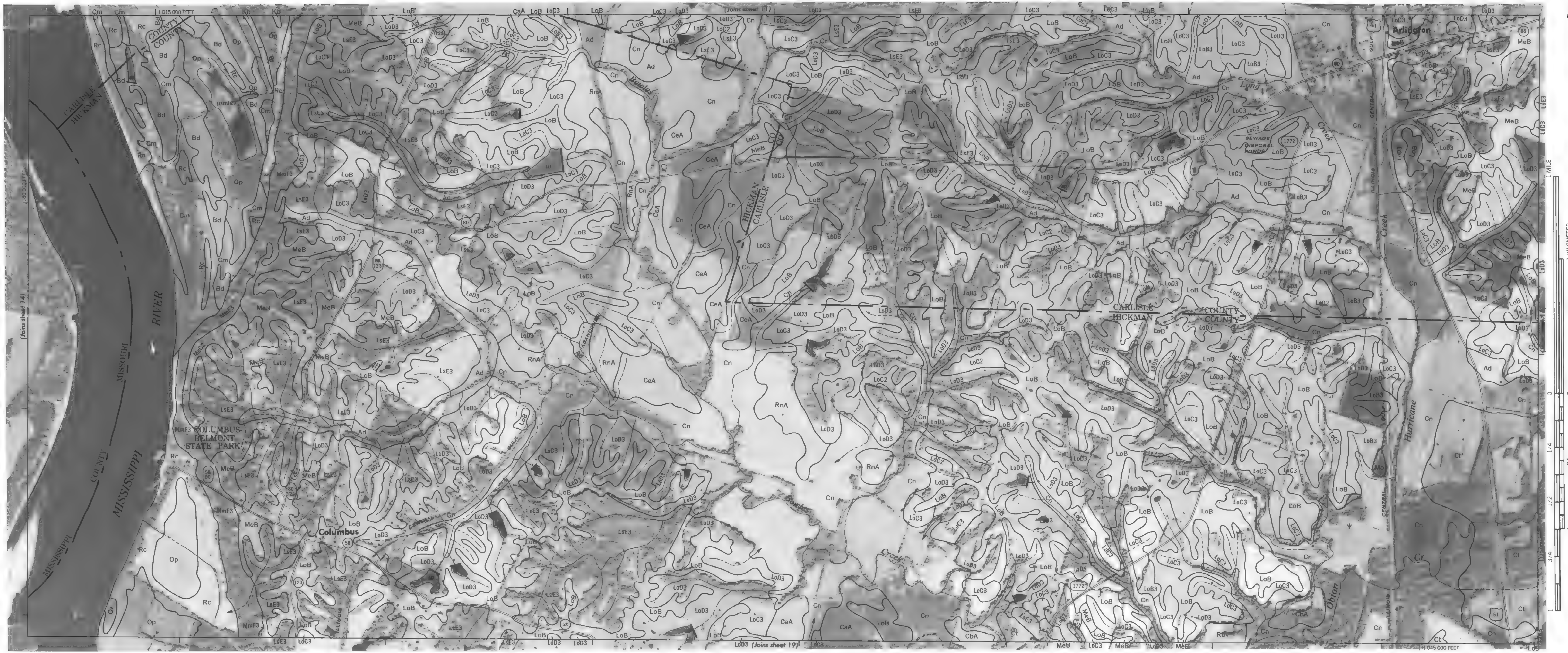
CARLISLE AND HICKMAN COS., KY NO. 15



CARLISLE AND HICKMAN COS., KY NO. 16

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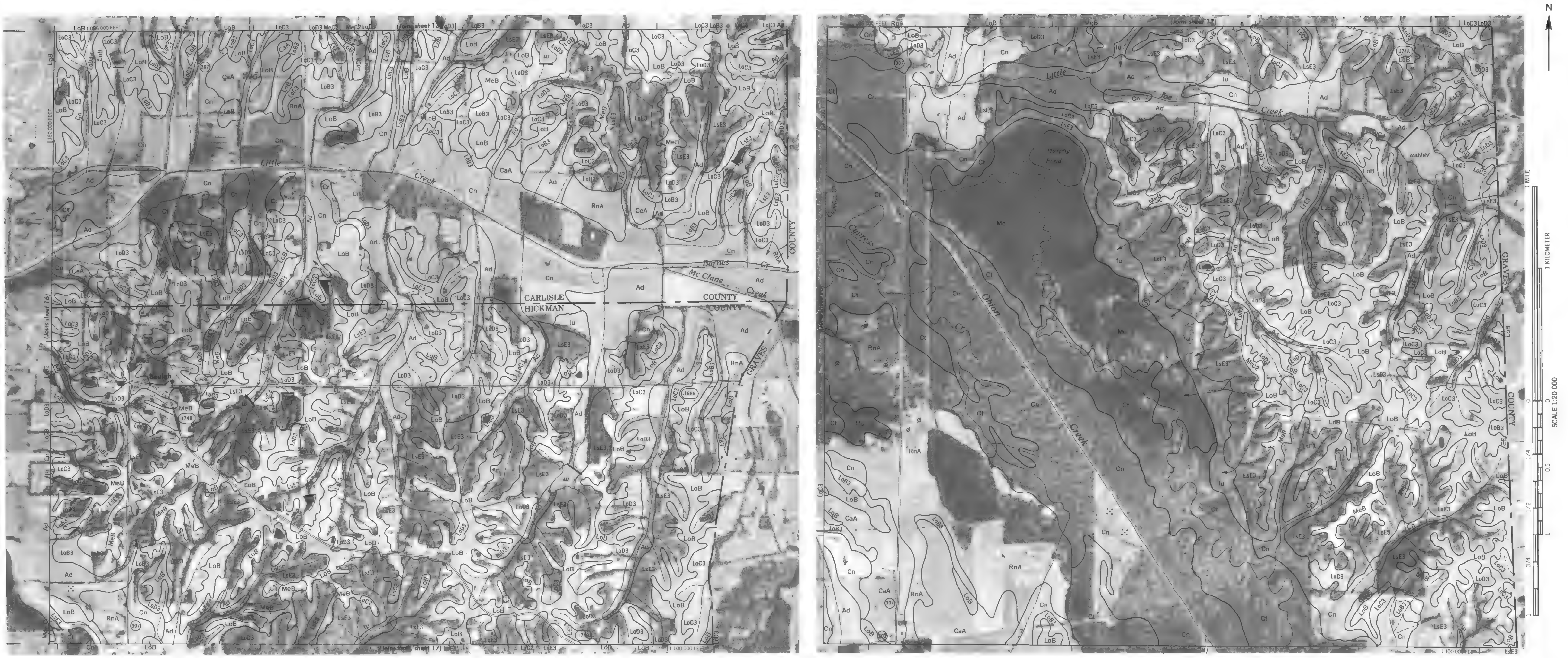
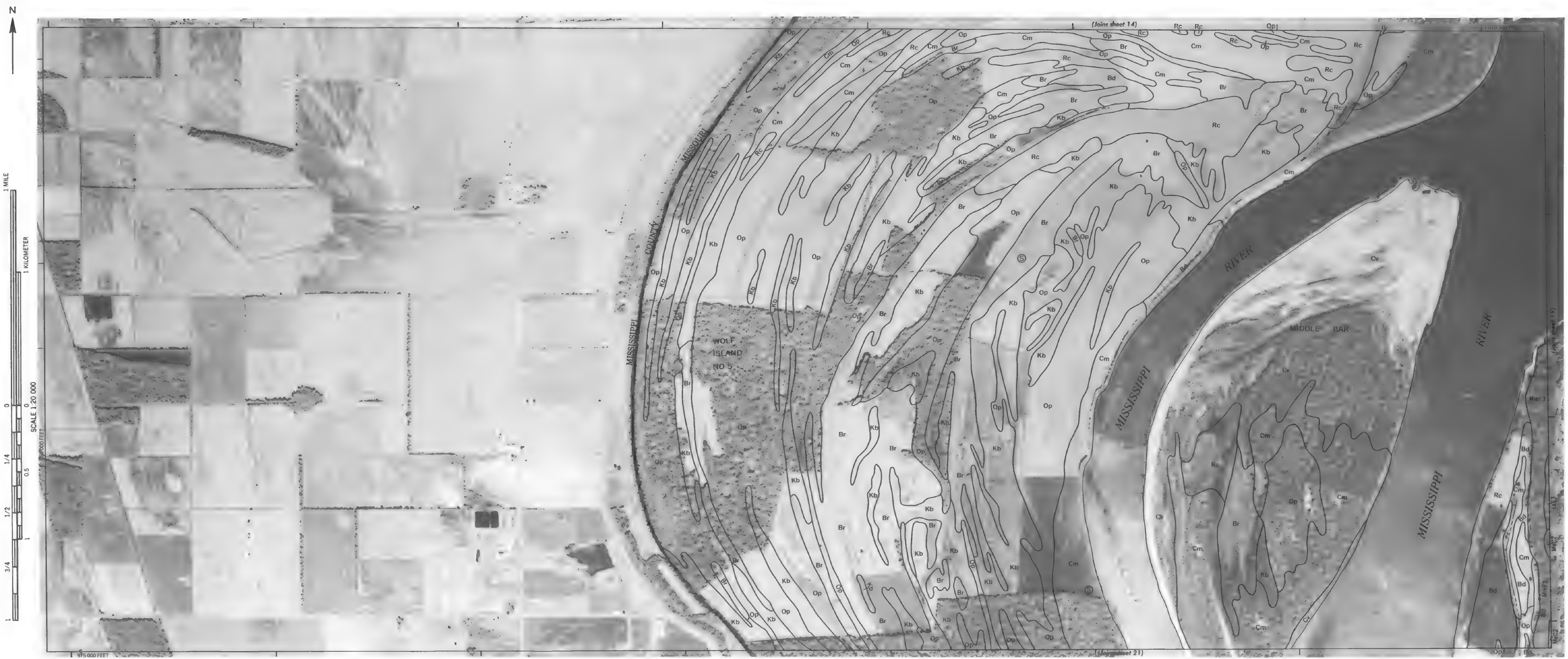
CARLISLE AND HICKMAN COS., KY NO. 17





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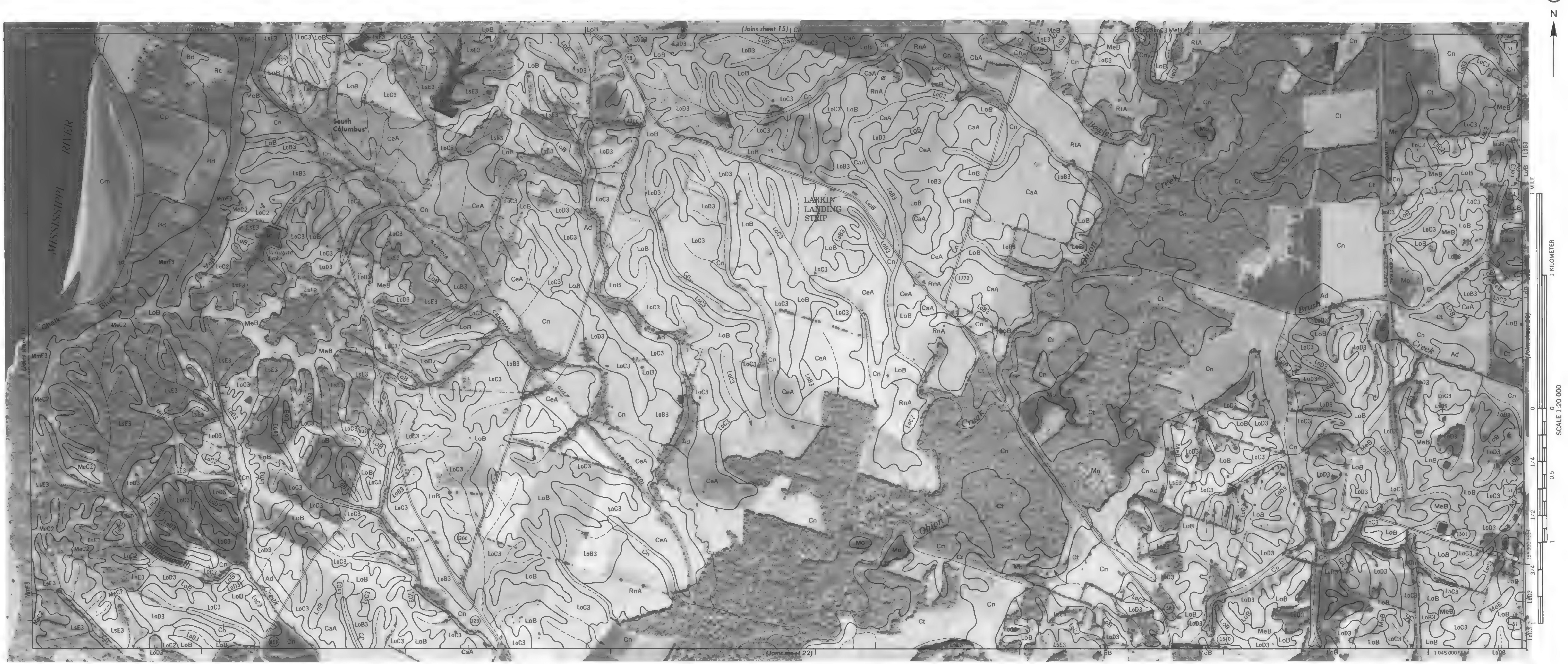

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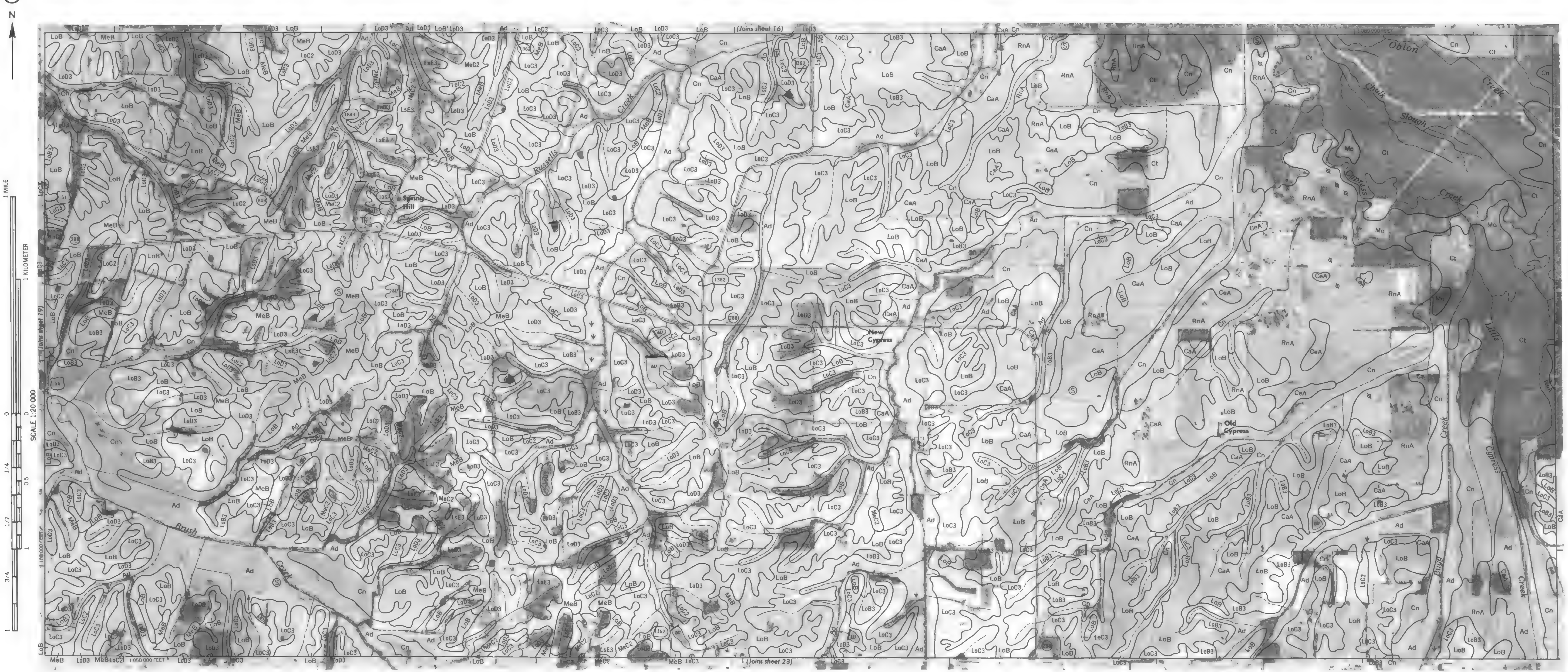
CARLISLE AND HICKMAN COS., KY NO. 19



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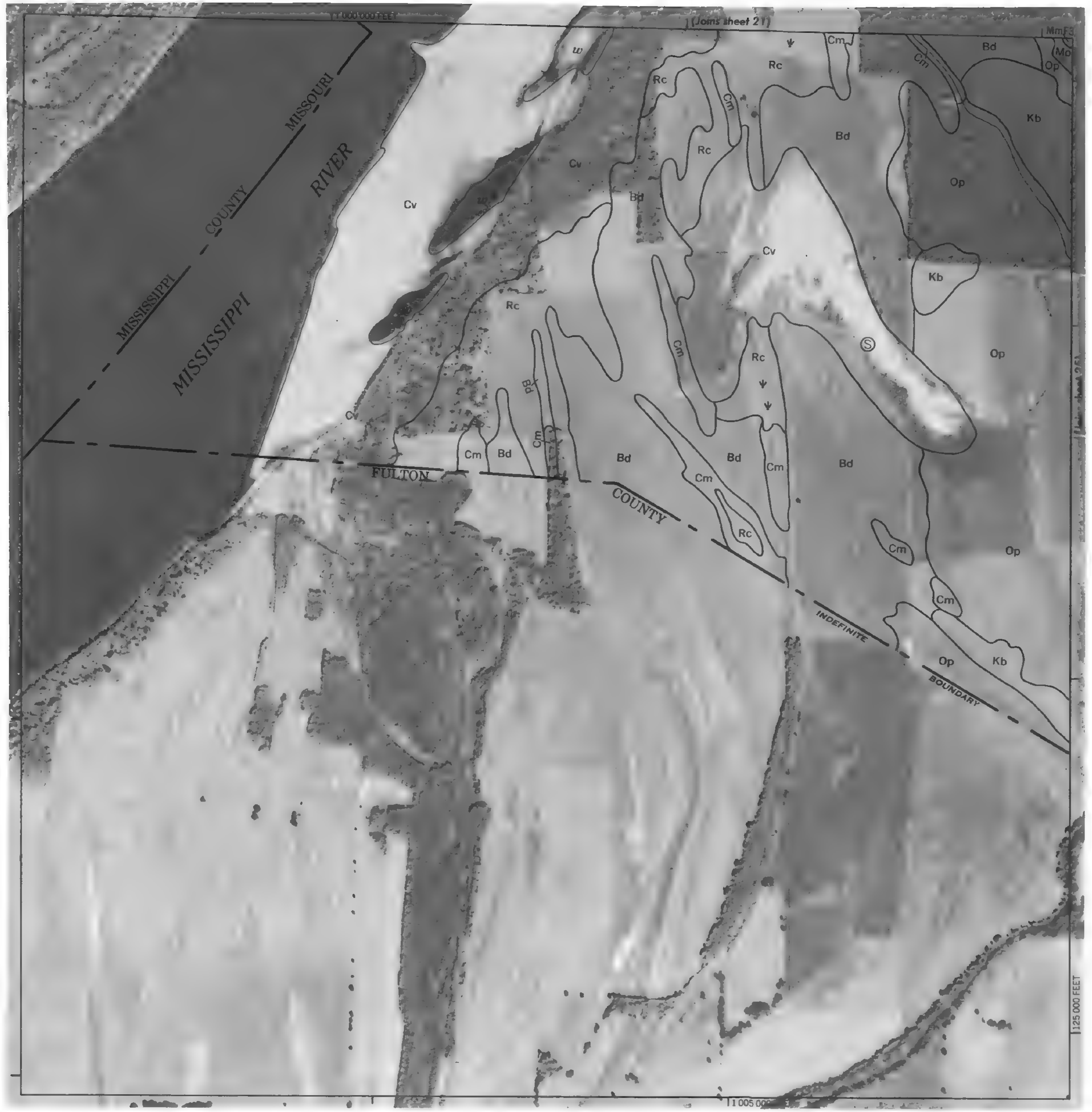
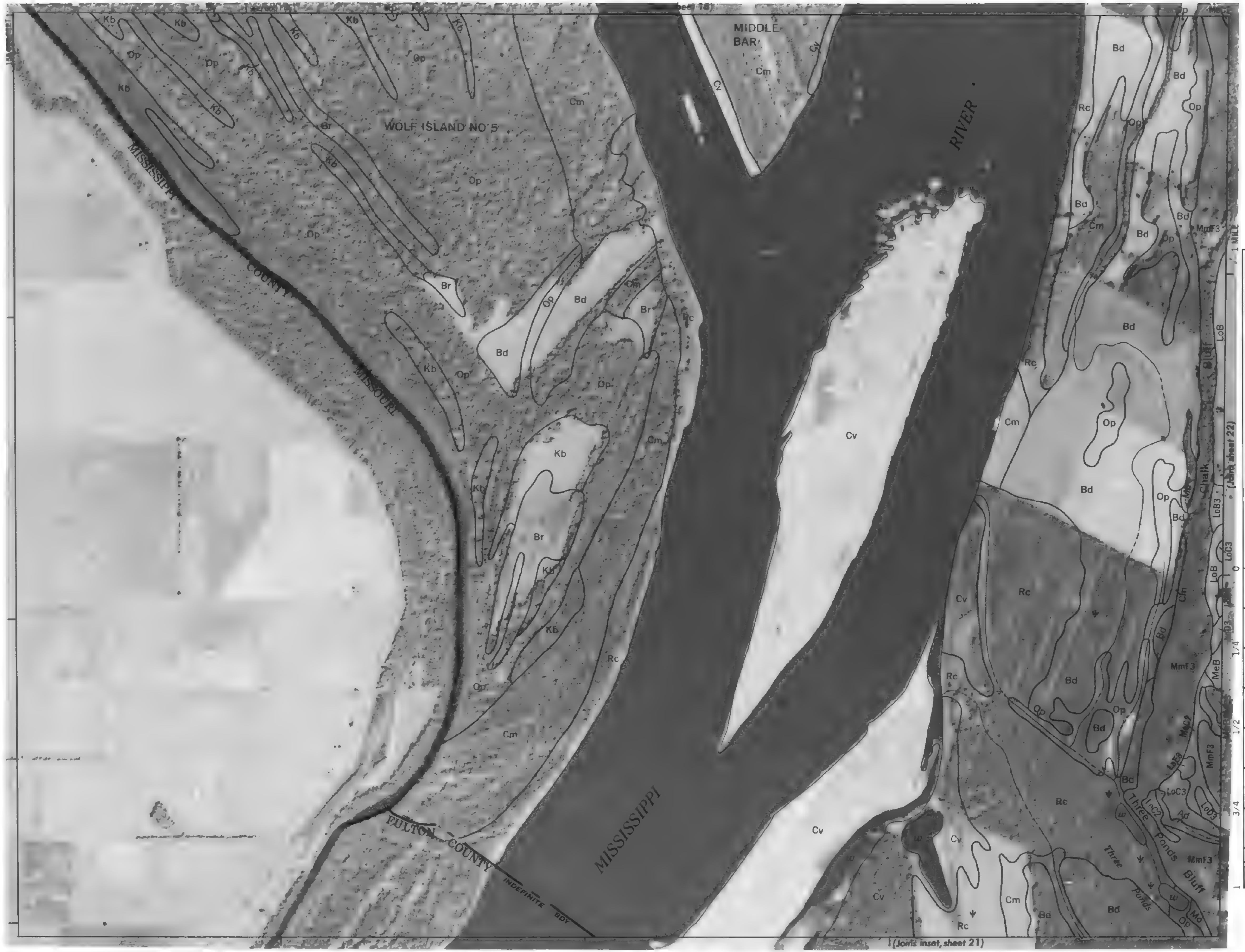
CARLISLE AND HICKMAN COS., KY NO. 21





21

N

1 MILE
1 KILOMETER
SCALE 1:20 000
0
1/4
1/2
3/4
1
0
0.5
1

N

CARLISLE AND HICKMAN COUNTIES, KENTUCKY — SHEET NUMBER 22

1 MILE

1 KILOMETER

SCALE 1:20 000

0 1/4 1/2 3/4 1

0 0.5 1

CARLISLE AND HICKMAN COS., KY NO. 22

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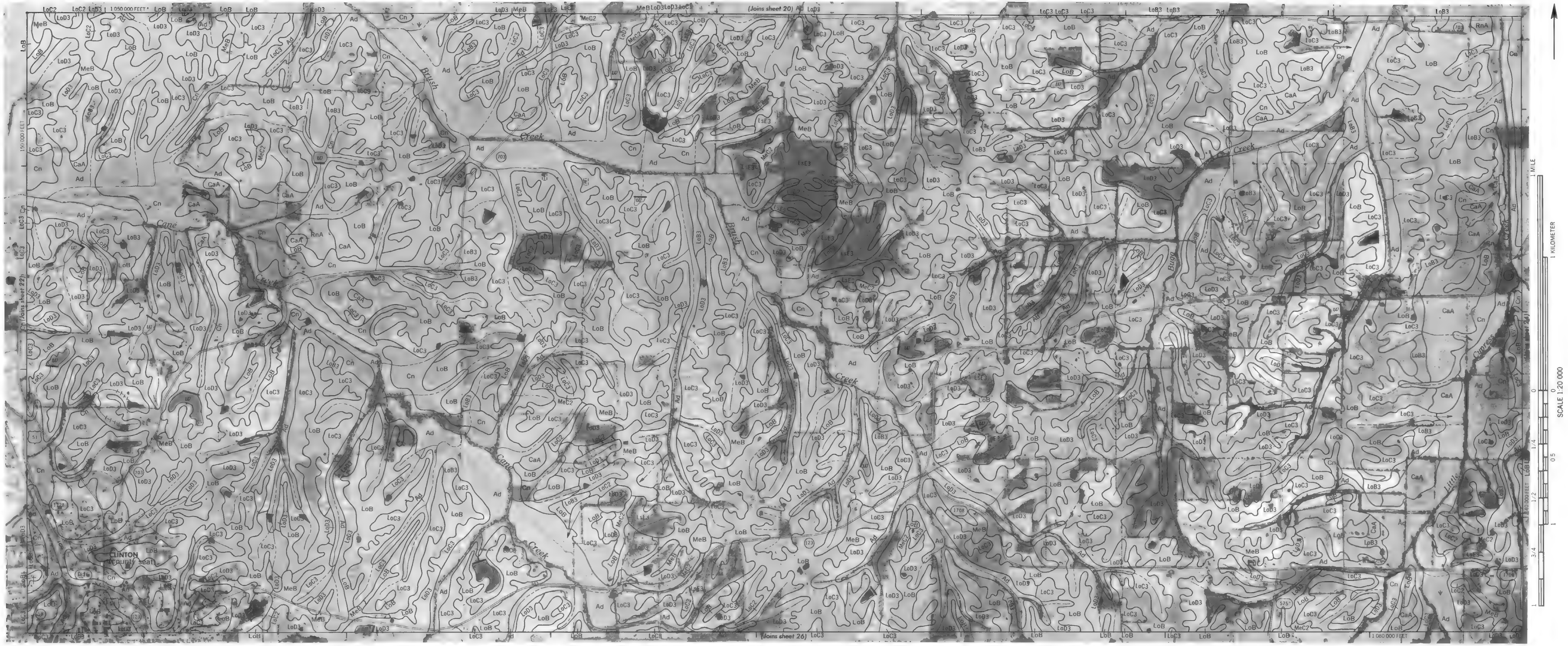
CARLISLE AND HICKMAN COS., KY NO. 23



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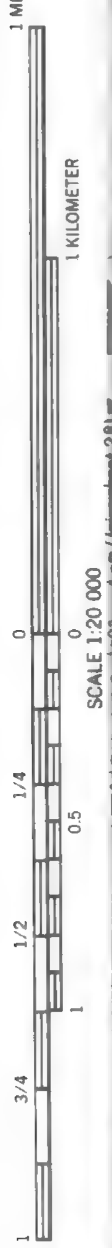

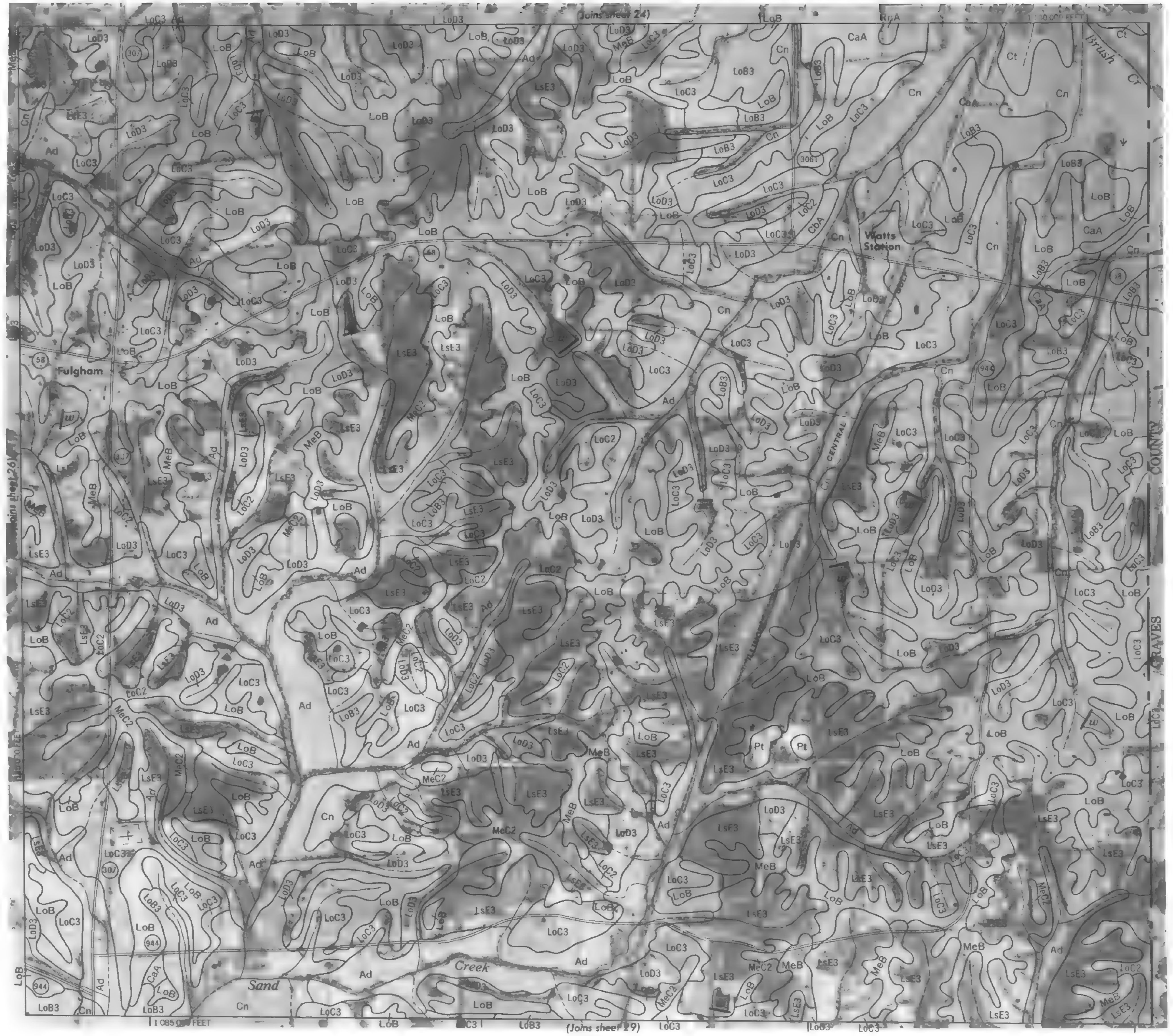

CARLISLE AND HICKMAN COS., KY NO. 24

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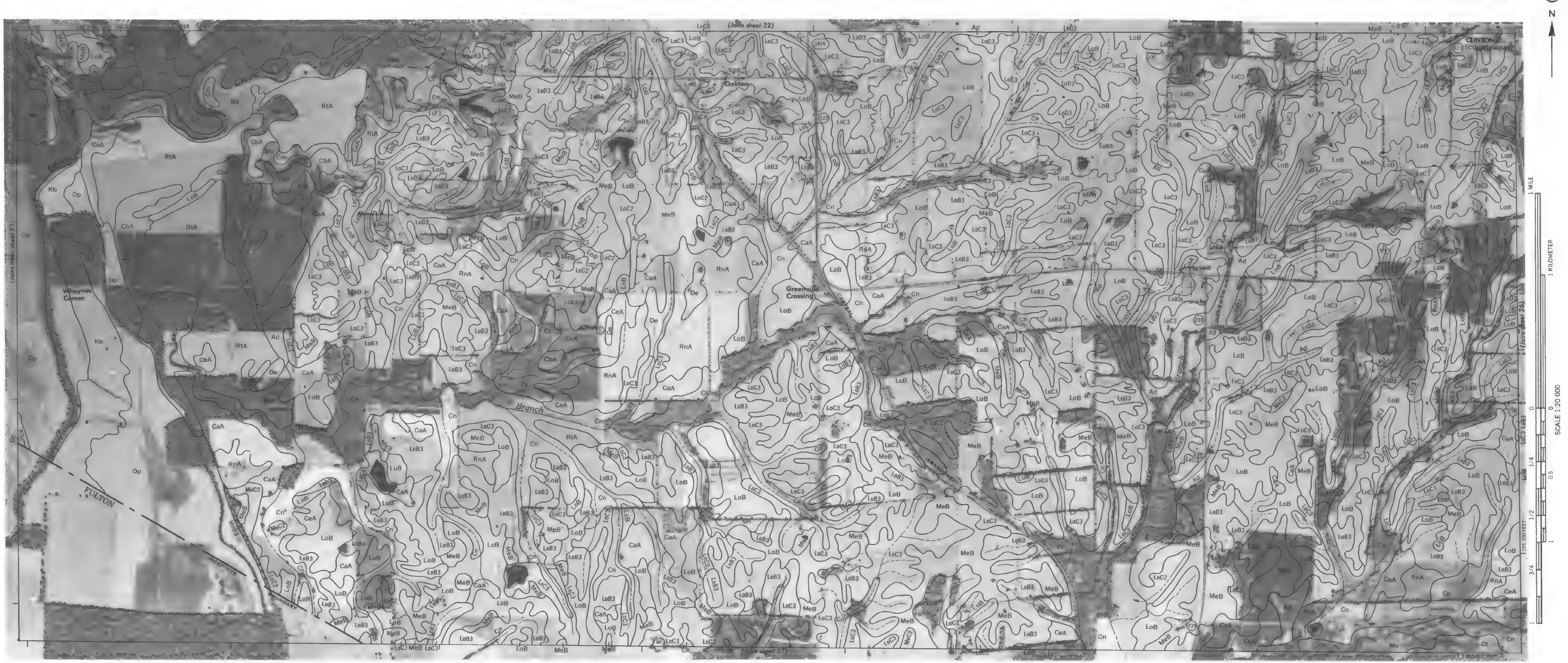
CARLISLE AND HICKMAN COS., KY NO. 25



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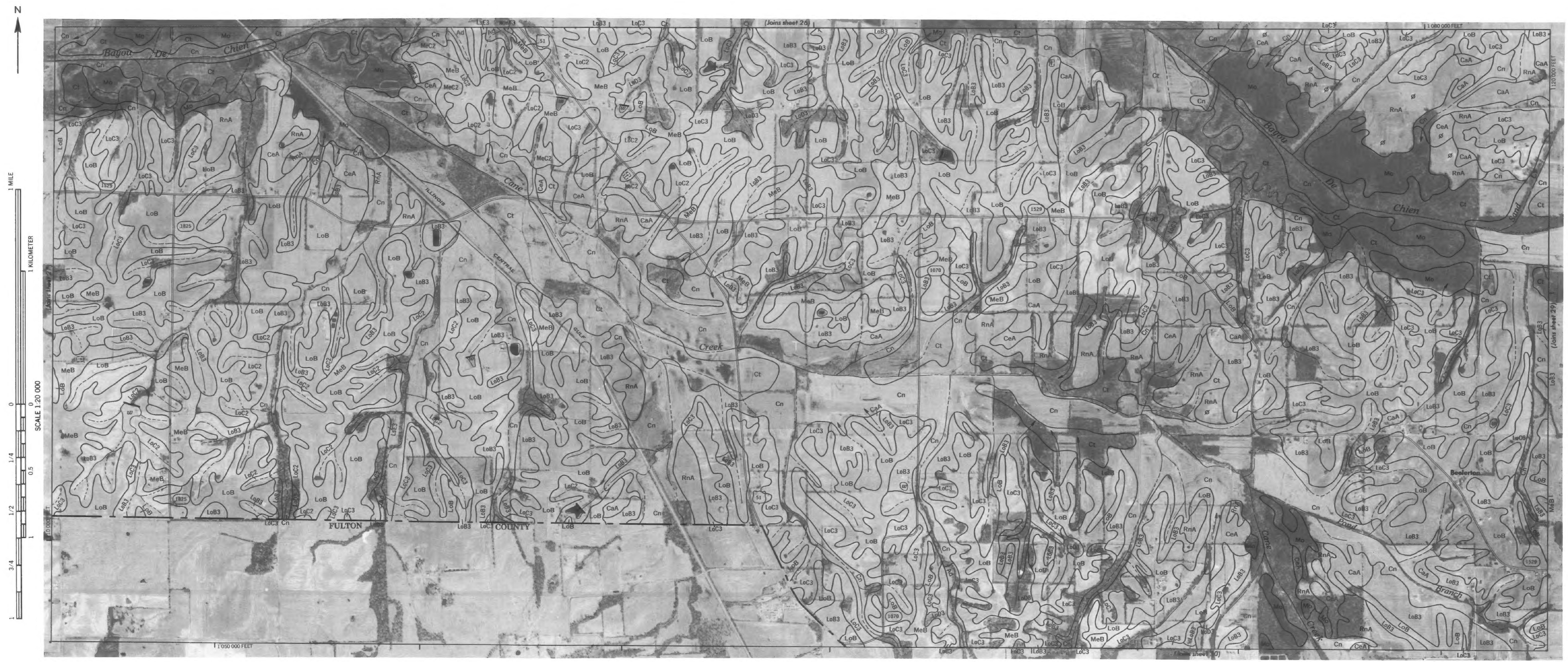

CARLISLE AND HICKMAN COS., KY NO. 28

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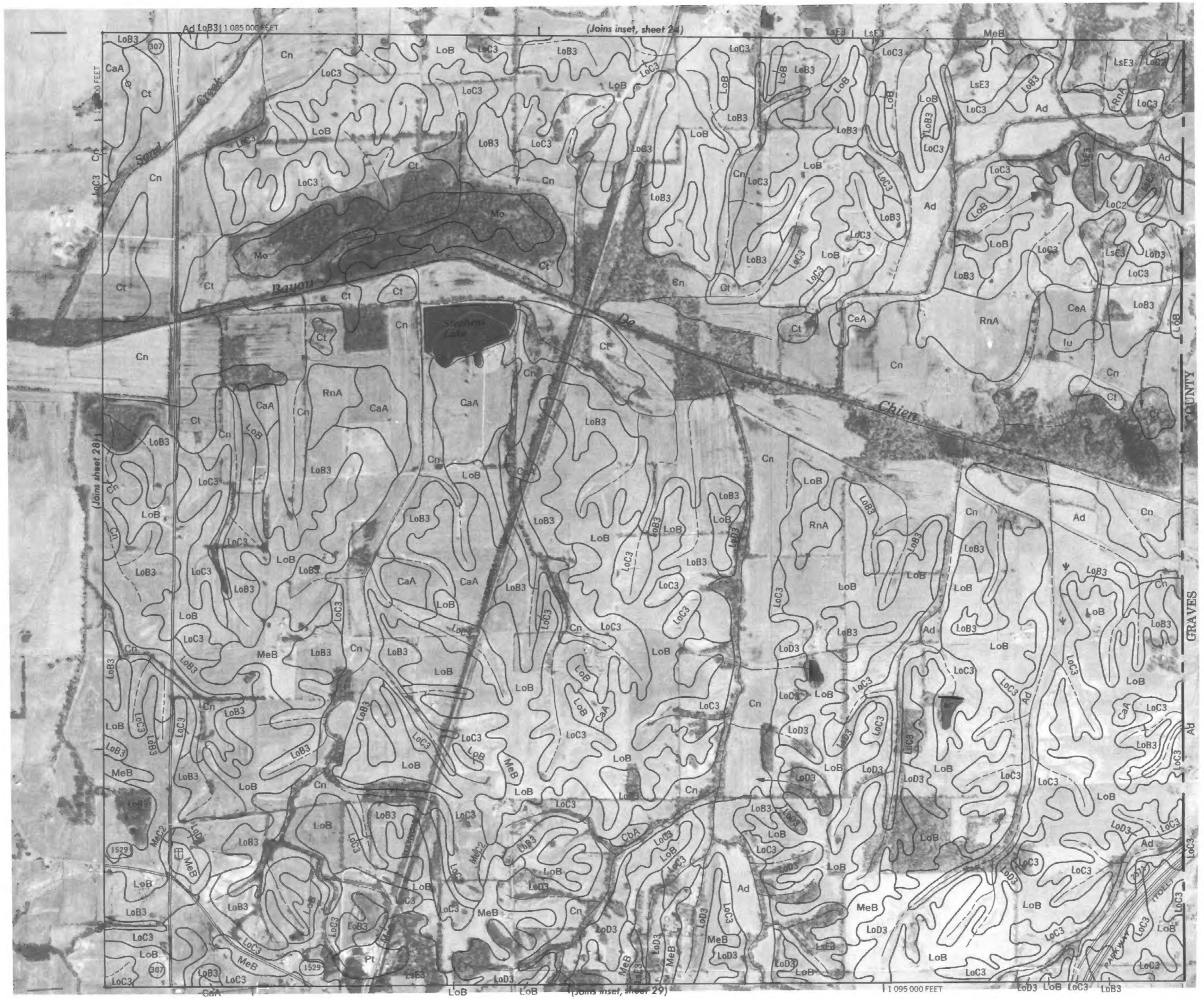

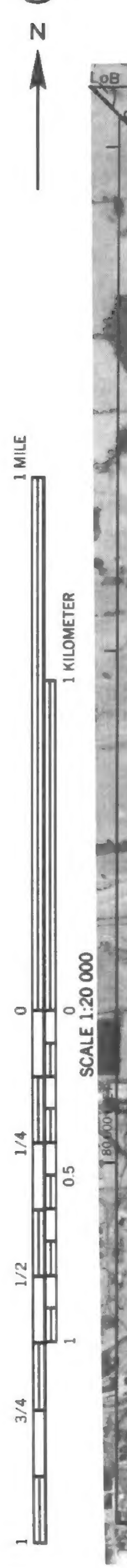

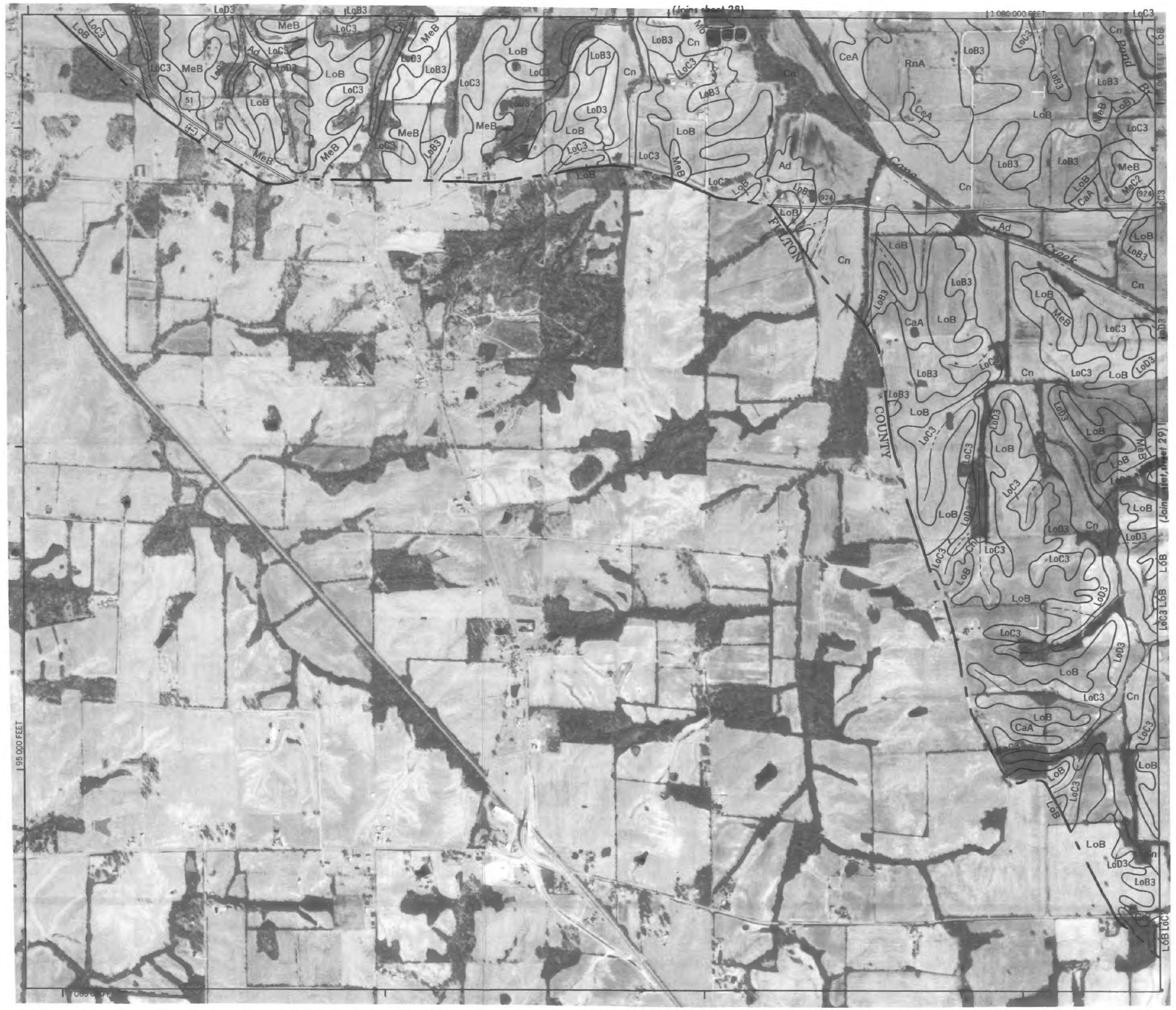

CARLISLE AND HICKMAN COS., KY NO. 30

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